THE JOURNAL OF AGRICULTURE

OF WESTERN AUSTRALIA

MONWEALTH INST.
LIBRARY
21 OCT 1955
Accn. 30

VOL. 4 No. 4
(Third Series)

JULY—AUGUST 1955

Registered at the G.P.O., Perth, for transmission by post as a periodical.

PRICE 2/-

With good management and . . . .

POULTRY FEEDS

WESFARMERS

"I average 200 eggs per bird per year"
—says Mr. A. C. N. BUTCHER,
Lilac Poultry Farm,
Gosnells

For four years Mr. Butcher has used Wesfarmers Poultry Feeds where previously he had mixed his own

You, too, Mr. Poultry Farmer can obtain equally good results

Ring, Write or see personally the . . . . **Free Advisory Service of WESFARMERS, WELSHPOOL** **(WM 541) who will visit you by appointment**

The JOURNAL OF THE DEPARTMENT OF AGRICULTURE
WESTERN AUSTRALIA

VOL. 4 (Third Series) JULY – AUGUST, 1955 No. 4

Published every second month by the Department of Agriculture, St. George's Terrace, Perth

The subscription rate (which includes postage) is 10s. per annum. Single copies 2s. each.

Edited by J. A. MALLETT

Articles which appear in the "Journal" may be reprinted, provided that the "Journal" and the authors are acknowledged.

Issued by direction of THE MINISTER FOR AGRICULTURE.

COVER PICTURE

During August, the W.A. Working Sheep Dog Association holds its annual field trials. These three border collies, Riley, Florrie and Bob, are well-known trial performers owned by Mr. E. G. Riley of Gingin. Florrie, now 16 years old has gained the State Championship on two occasions, in 1946 and 1951. She is a daughter of Mr. E. G. Riley's famous border collie, Jean, who was State Champion in 1938 and 1939.

IN THIS ISSUE

Tractor Service Hints—The Hydraulic Lift and Linkage 389

Gascoyne Research Station 397

A Stool-Ladder for the Orchard .... J. A. Mallett 405

Apple Blemishes and Their Control .... C. F. H. Jenkins 409

List of Departmental Publications 413

Weeds of W.A.—Soursob (*Oxalis pes-caprae L)* G. R. W. Meadly 417

Brucellosis of Cattle .... C. R. Toop 421

The Vermin Bonus System in W.A.—Part 1 .... C. D. Gooding 433

Farm and Home—Pressing Woollen Clothes .. Brenda Cleeve 451

The Effect of Hormone-Like Herbicides on Dwalganup Subterranean Clover .... G. R. W. Meadly and G. A. Pearce 457

Books for Farmers 461

Spring Sown Oats for Hay .... F. E. Ryan 463

Sorghums for Grain and Fodder in the South West F. E. Ryan 465

Fowl Pox .... P. M. A. Harwood 473

A New Model Hose Level .... J. E. Watson and B. a' B. Marsh 479

Recent Rural Radio Talks—

Submitting Plant Specimens for Disease Identification Rose McAleer 491

Grading of Fruit and Vegetables .... E. H. Rawson 492

Sunrise and Sunset Tables 496

By Authority: REG. A. NICHOLAS, Acting Government Printer, Perth.

86146/8/55—14,500

THE DEPARTMENT OF AGRICULTURE
of
WESTERN AUSTRALIA

Minister for Lands and Agriculture:
THE HON. E. K. HOAR, M.L.A.

Director of Agriculture:
G. K. BARON HAY.

Deputy Director of Agriculture:
I. THOMAS.

Chief Administrative Officer:
W. HOPKINSON

Controller of Abattoirs.—T. C. ROWLANDS.
Rural Economic Adviser.—R. P. ROBERTS.
Chief Clerk.—A. W. R. HUME.
Editor, "Journal of Agriculture."—J. A. MALLETT.
Librarian.—Miss A. E. M. WHITE.

ANIMAL DIVISION

Chief Veterinary Surgeon and Chief Inspector of Stock.—C. R. TOOP.
Assistant Chief Veterinary Surgeon.—E. F. TWADDLE.
Veterinary Surgeons.—J. SHILKIN; J. CRAIG; P. M. A. HARWOOD (Head Office); R. HARLEY; P. B. LEWIS (Bunbury).
Stock Inspectors.—J. F. ROBINSON; S. COOK, B. D. HOOPER; A. C. LINTO; J. MITCHELL; C. W. TOBIN (Head Office); J. R. BLACKBURN; R. J. CARROLL; W. BOOTH (Bridgetown); C. R. DIXON (Bunbury); T. INGATE (Derby); E. S. M. SMITH (Geraldton); E. G. McKENZIE (Kalgoorlie); B. EVANS (Kellerberrin); A. K. AITKEN (Midland Junction); D. G. STRANG (Moora); C. V. HADLEY (Mt. Barker); N. W. FROOME (Wagin); E. C. GOLDRING (Wallal).

ANIMAL HEALTH AND NUTRITION LABORATORIES

Principal.—H. W. BENNETTS.
Animal Nutrition Officer.—L. C. SNOOK.
Assistant Animal Nutrition Officer.—P. D. RAMM.
Veterinary Pathologist.—J. M. ARMSTRONG.
Biochemist.—M. C. NOTTLE.
Manager, Bramley Research Station.—N. A. SCOTT.

POULTRY BRANCH

Officer-in-Charge.—R. H. MORRIS.
Advisers.—D. K. GILES; L. J. GAFFNEY.
Instructors.—A. R. WRIGHT; R. VAGG.
Inspectors.—W. WARD; J. A. HOY.

BRANDS

Registrar of Brands.—A. R. TOMLINSON.

HORTICULTURAL DIVISION

Superintendent of Horticulture.—H. R. POWELL.
Assistant Superintendent.—T. C. MILLER.
Viticulturist.—W. R. JAMIESON.
Advisers.—F. MELVILLE; J. CRIPPS (Head Office); S. HARDISTY (Bridgetown); K. T. WHITELY (Mt. Barker).
Senior Packing Instructor.—J. S. BLOOMFIELD.
Assistant Packing Instructor.—A. B. THOMAS.
Senior Instructor.—T. F. HERLIHY.
Instructors.—A. T. GULVIN (Albany); R. G. CAHILL (Bridgetown); A. BRIMSON (Midland Junction); J. C. ROWBOTHAM (Bunbury); R. L. CAILES (Kalamunda); H. ARGYLE (Kelmscott); W. J. RENNICK; (Manjimup); L. G. HAYWARD (Mundaring); W. CAMPBELL (Narrogin); A. O. WELLS (Head Office).
Assistant Instructor.—N. GROWDEN (Head Office.)
Inspectors.—J. F. S. MAUNSELL; J. SLAMON; W. J. PHARAZYN (Fremantle); E. H. RAWSON, W. WEAR (Markets); W. WARDELL-JOHNSON (Kalgoorlie); G. SIMPSON (Fremantle).
Senior Fruit Fly Inspector.—E. H. ELKINGTON.
Fruit Fly Inspectors.—E. BADHAM; A. FORSYTH; F. JACKSON; H. C. LEITCH; R. JACKSON; A. SIBSON (Metropolitan); S. WILLIAMS (Bunbury); M. EVANS (Chittering); N. BROCKMAN (Donnybrook); I. RENNIE (Harvey); L. NEAVE (Kalamunda); J. L. LITTLELY (Mundaring); G. DIGNEY (Pinjarra); L. ROLINSON (Swan); J. HART (Kelmscott).

VEGETABLE BRANCH

Officer-in-Charge.—J. P. ECKERSLEY.
Assistant Officer-in-Charge.—J. P. FALLON.
Adviser.—T. WACHTEL.
Instructors.—J. C. PALMER; M. HARDIE; J. NAJMAN (Albany); G. C. DE HAAN (Manjimup).
Inspectors.—F. H. TONKIN; J. STEELE; F. HERBERT (Geraldton).
Research Station Manager.—D. C. FOURACRES.

TOBACCO BRANCH

Instructor.—R. KLANJSCEK.
Acting Manager of Research Station and Field Technician.—H. G. MORTLOCK.

APICULTURAL BRANCH

Government Apiculturist.—R. S. COLEMAN.
Technician.—A. C. KESSELL; S. R. CHAMBERS.

DAIRYING DIVISION

Superintendent of Dairying.—M. CULLITY.
Assistant Superintendent.—H. G. ELLIOTT.
Agrostologist.—F. E. RYAN.
Dairy Cattle and Pig Husbandry Officer.—K. NEEDHAM.
Advisers.—K. M. HOPE; F. BRIDGMAN (Head Office); B. WILLIAMS (Bunbury); A. SHARP (Busselton); A. W. HOBBS (Bridgetown); A. E. BAKER (Manjimup); R. A. BETTENAY (Denmark); R. SPRIVULIS, J. A. CARBERRY (Wokalup Research Station).
Officer-in-Charge, Dairy Factory and Produce Inspection.—H. M. LISTER.
Dairy Produce Inspector.—A. H. HOBBS.
Instructors.—N. INGLETON, G. R. W. SCOTT, H. J WEST (Head Office); D. C. MICKLE, B. ARNEY (Bunbury); H. MASLIN (Capel); J. T. McNALLY (Manjimup).
Pure Bred Herd Recorders.—J. A. DARRAGH; G. D. BASTYAN.
Research Station Managers.—V. WESTON (Denmark); K. W. SIMES (Wokalup).

WHEAT AND SHEEP DIVISION

Acting Superintendent of Wheat Farming.—A. S. WILD.

Acting Superintendent.—H. G. CARISS.

WHEAT AND SHEEP BRANCH

Plant Geneticist.—J. T. REEVES.

Advisers.—N. DAVENPORT; H. M. FISHER; W. P. CULLINANE (Head Office); C. M. RALPH (Esperance); T. E. McDOWELL (Narrogin); H. G. NEIL; B. F. CARLIN (Moora); G. L. THROSSELL, G. R. GREWAR (Geraldton); G. T. HALPIN (Katanning); A. F. SMITH, (Mt. Barker).

Instructors.—J. W. GILCHRIST (Geraldton); S. D. BYRNE (Narrogin).

Research Station Managers.—R. L. DOWN, (Avondale); G. W. ANDERSON (Chapman); F. C. F. GISHUBL (Merredin); E. B. NORRIS (Salmon Gums and Esperance Downs); D. R. BATEMAN (Wongan Hills).

SHEEP AND WOOL BRANCH

Sheep and Wool Adviser.—W. L. McGARRY.

Sheep and Wool Instructor.—J. REILLY.

Shearing Instructor.—M. BUTLER.

SEED CERTIFICATION AND WEED BRANCH

Officer-in-Charge.—G. R. W. MEADLY.

Botanists.—B. J. QUINLIVAN; G. A. PEARCE.

Weed Control Officers.—K. RYAN (Metropolitan); J. N. HUTCHINSON (Bunbury); N. S. MARR (Geraldton); E. G. McKENZIE (Kalgoorlie); W. H. JOHNSON (Katanning); C. V. CAHILL (Northam); I. D. LYON (Metropolitan).

SOIL CONSERVATION DIVISION

Commissioner of Soil Conservation.—G. H. BURVILL.

Assistant Commissioner.—L. C. LIGHTFOOT.

Senior Soil Research Officer.—S. T. SMITH.

Advisers.—J. E. WATSON (Northam); G. W. SPENCER; B. a'B. MARSH; T. C. STONEMAN; D. J. CARDER; J. L. McMULLAN; C. V. MALCOLM; J. C. GRASBY.

Clearing Control Inspector.—W. BRYAN.

IRRIGATION BRANCH

Officer-in-Charge.—H. J. K. GIBSONE.

Assistant Officer-in-Charge.—G. GAUNTLETT (Harvey).

Advisers.—J. LEWIS (Bunbury); B. SWAN (Harvey).

Technicians.—G. C. BROWN, A. B. MORRISON (Bunbury); A. H. BOSCH (Waroona).

RESEARCH DIVISION

Chief Plant Nutrition and Research Officer.—T. C. DUNNE.

Senior Plant Nutrition and Research Officer.—L. T. JONES.

Research Officers.—J. A. PARISH; N. J. HALSE; E. N. FITZPATRICK.

MURESK AGRICULTURAL COLLEGE

Principal.—W. SOUTHERN.

Assistant Principal and Senior Lecturer.—A. J. T. MARSHALL.

Science Lecturer.—A. H. WALKINGTON.

Lecturer, House and Sports Master.—J. M. MASON.

Farm Manager and Demonstrator.—H. A. LOVEGROVE.

Dairy Instructor.—W. BRIDLE.

Piggery Instructor.—P. GARSTONE.

Poultry Instructor.—A. M. GARDINER.

Horticultural Instructor.—R. A. HILL.

Sheep Instructor.—H. P. DWYER.

Farm Engineering Instructor.—J BRISTOW STAGG.

Building Instructor.—P. St. QUINTIN.

MISCELLANEOUS BRANCHES

BOTANICAL BRANCH

Government Botanist and Curator of State Herbarium.—C. A. GARDNER.

Senior Botanist.—R. D. ROYCE.

Assistant Botanist.—J. W. GREEN.

PLANT PATHOLOGY BRANCH

Government Plant Pathologist.—W. P. CASS SMITH.

Senior Plant Pathologist.—H. L. HARVEY.

Plant Pathologists.—Miss O. M. GOSS; R. F. DOEPEL; Miss R. McALEER

ENTOMOLOGY BRANCH

Government Entomologist.—C. F. H. JENKINS.

Senior Entomologist.—P. N. FORTE.

Entomologists.—D. G. SHEDLEY; B. A. B. EDWARDS; J. A. BUTTON; L. E. KOCH; G. D. RIMES.

VERMIN CONTROL BRANCH

Chief Vermin Control Officer.—A. R. TOMLINSON.

Assistant Chief Vermin Control Officer.—J. S. CRAWFORD.

Senior Vermin Control Officer.—C. J. MARSHALL.

Regional Vermin Control Officer.—A. G. VEITCH.

Research Officer.—C. D. GOODING.

Research Technicians.—L. A. HARRISON; J. L. LONG.

Regional Vermin Control Officers.—H. HART (Northern Agricultural Areas); J. W. LEIGHTON; S. M. HARVEY (South-West); J. C. McSWAIN (Coastal Areas); E. A. McHUGH (Eastern Wheatbelt); G. E. MILES (Upper Great Southern); C. J. WOODBURY (Central Great Southern); W. H. TESTER.

Vermin Control Officers.—G. D. ATKINSON; G. V. CROOKE; D. J. KING; L. C. McCRACKAN; D. K. MULHALL; H. A. PEDRETTI; C. L. SMITH; J. C. SMITH; N. A. SMITH; K. R. STUART; R. H. TAYLOR; T. J. TOZER; J. N. TYERS; A. R. ROWLAND.

Vermin Control Officers (Wild Dog Control).—C. K. BLAIR (Pastoral Areas); A. G. MOORE (Southern Areas); R. J. FRASER (North-West); P. J. McDONALD (Kimberleys); A. J. CARLISLE (Eastern Goldfields).

Vermin Fence Inspectors.—G. E. RICHARDS (Burracoppin); R. CORNEY (Yalgoo).

NORTH-WEST BRANCH

Officer-in-Charge.—W. M. NUNN.

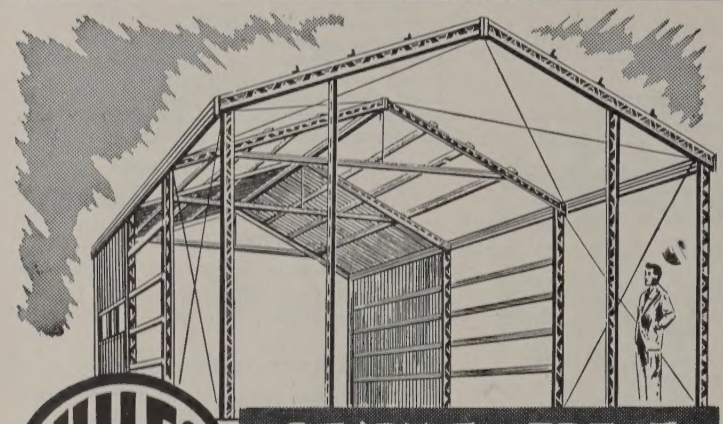
Agrostologist.—B. RUMICH.

Tropical Adviser.—J. J. C. SUCKLING.

Agricultural Advisers.—H. SUIJDENDORP (Gascoyne Research Station); J. LAWSON (Derby); J. B. RITSON (Kimberley Research Station); K. FITZGERALD (Kimberley Research Station); D. G. WILCOX (Wiluna).

Cattle Adviser.—G. A. SMITH (Broome).

Research Station Managers.—R. G. NAILARD (Gascoyne); N. A. BRETT-YOUNG (Kimberley).



WILES
Lead with Steel Buildings Too!

Known throughout Australia and now manufactured in Western Australia, Wiles Steel Building Frames provide for every farm shed and farm housing requirements. Inquiries welcomed

READY-TO-ERECT 20ft. SPAN STEEL BUILDING FRAMES

Also available in:—

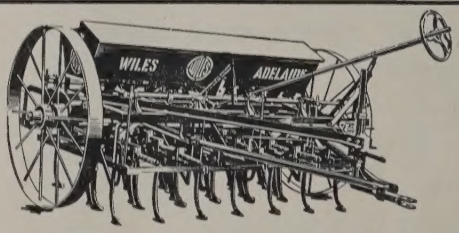
30ft., 40ft., 50ft., & 60ft. SPANS

Strong, Rigid and Permanent Wiles Standardised Construction method makes additions possible at any time, without inconvenience!

Wiles Lattice type buildings are engineered to exacting specifications. Standard interchangeable sections enable accurate assembly by unskilled labour. The complete Wiles range of steel buildings have been designed and thoroughly proved and are manufactured in standardised types allowing for the production to your requirements of almost any type of building

Wiles Make Steel Building Frames for:
Hay Barns, Implement Sheds, Shearing Sheds, Packing Sheds, Grain Stores, Wool Sheds, Garages, Staff Quarters, Cottages, Etc.

WILES
MANUFACTURING CO. LIMITED
14 ST. GEORGE'S TERRACE, PERTH
Telephone BA 3972



Rigid Tyne S.J. Combine

The machine for pasture renovation in hard soil conditions. Available with pneumatic or steel wheel equipment. Narrow tynes and extra clearance between floats and ground allows obstructions to clear machine quickly.

A proven Wiles Implement!

Please send me full details of the following (strike out that which is not applicable)—
RIGID TYNE COMBINE
STEEL BUILDINGS - COTTAGES
FULL RANGE TILLAGE IMPLEMENTS

NAME .....

ADDRESS .....

J.A. 5/6

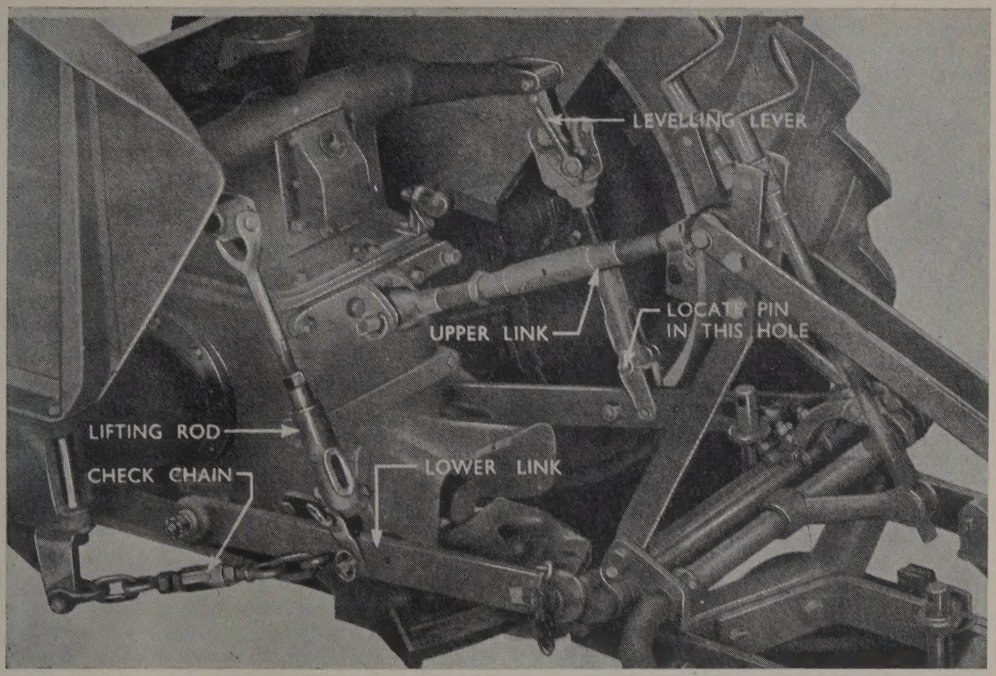


Fig. 1.—Hydraulic lift linkage assembly

TRACTOR SERVICE HINTS

The Correct Usage of the Hydraulic Lift and Linkage

(By courtesy of the Technical Group, Service Division Ford—Australia.)

WHEN using an implement with a new tractor for the first time, the operator soon discovers the best gear to select for the particular job in hand. In other words, the operator's experience enables him to use his tractor in the most economical manner.

For example, correct gear selection means minimum wheel spin, and therefore economy in tyre wear. It also means economical fuel consumption.

These are but two of the more obvious expenses in tractor operation.

In that last statement, "obvious" is the operative word, since most people note the obvious and act accordingly, hence the operator's selection of a particular gear.

SELDOM GETS NECESSARY CONSIDERATION

Correct usage of the tractor's hydraulic lift and linkage, on the other hand, does not bring to light such obvious advantages. Therefore it seldom gets the consideration that is necessary for efficient operation, which brings us to the object of this article.

To save time and money, it is essential that the operator should be fully conversant with the tractor as a whole, and this includes the lift and linkage.

Firstly, to clarify the adjustments and general operation of the three-point lift and linkage, let us examine the relationship of mounted plough operation to that of trailing ploughs.

The trailing plough is basically similar to its mounted counterpart in construction, in that they both have discs or mouldboards attached to a suitable frame. The trailing plough, however, is suspended

at three points, all of which are adjustable to some degree. They are the land wheel, front furrow wheel, and rear furrow wheel. When in work the land wheel controls the depth and the front furrow wheel keeps the plough level. The rear furrow wheel is usually angled to take the load imposed by side draft. The whole unit is attached to the tractor at one point, the drawbar, which only serves as a link by which the implement is drawn through the ground.

REPLACE DRAWBAR

With the mounted plough, however, the linkage lower links replace the drawbar. However, their function does not end here. They also provide a method by which the implement may be lifted clear of the ground.

The fact that the lower link hitch point is much higher on the mounted plough than the point of pull on the trailing implement means that the mounted unit requires some method of stabilisation to prevent the plough tipping forward as it is lowered into the work. This is one of the reasons for the provision of the upper link. The other reason is to provide the third point necessary for lifting the implement.

The fact that the mounted plough is held level transversely by the lower links obviates the use of a front furrow wheel.

The level of the plough is adjusted by means of the levelling box incorporated in the right hand lifting rod, and the fore and aft level is maintained by adjustment of the upper link of the three-point linkage.

The depth of operation of the implement is still controlled by an adjustable depth wheel on the plough, since ground contact is the most accurate method. To sum up this comparision, the list below shows the equivalent parts of the two types of plough and the function that they perform:—

EASIER METHOD OF ATTACHMENT

It will be seen, therefore, that for the smaller implement the three-point lift and linkage provides a much more convenient method of attachment; at the same time it will be obvious that a distinct relationship exists between the operation of both types of implements.

Most tractor owners will have made themselves familiar with their tractor and its accessories through the Instruction Booklet issued on the subject. The section devoted to the hydraulic lift and linkage is quite comprehensive. However, enlargement on a few points may prove of value.

When raising the implement the operator is advised to release the control lever smartly at the conclusion of raising, and not to retain the lever in the raised position.

The reason for this instruction is that at the conclusion of the lifting cycle the ram is fully extended, therefore the oil has to have an alternative circuit, since the pump continues to force oil into the valve box.

The only alternative is through the unloading valve, included in the circuit as a safety device. This valve is forced off its seat at the conclusion of the ram stroke, and remains unseated while the lever is held up, and since this is undesirable, the practice should be avoided.

SPEED OF DESCENT

The speed of descent of an implement can be controlled by the positioning of the control lever when lowering. In the case of the mouldboard plough with cast shares, it may be desirable to lower at a slower rate if the ground is hard or stony.

The lever in the fully down position allows the implement to fall quickly. At intermediate positions between neutral and the fully down position, the rate of

OPERATIONAL FUNCTION	TRAILING PLOUGH	MOUNTED PLOUGH
Method of hitch and pull	Drawbar	Lower links
Method of levelling plough	Front furrow wheel	Levelling lever
Method of depth control	Land wheel	Land wheel
Side Draft Control (Disc)	Rear furrow wheel	Rear furrow wheel
Side Draft Control (Mouldboard)	Rear furrow wheel &/or rear furrow landside	Rear mouldboard landside
Implement Lift for transport	Implement lifting mechanism (e.g., screw lift)	Hydraulic power lift

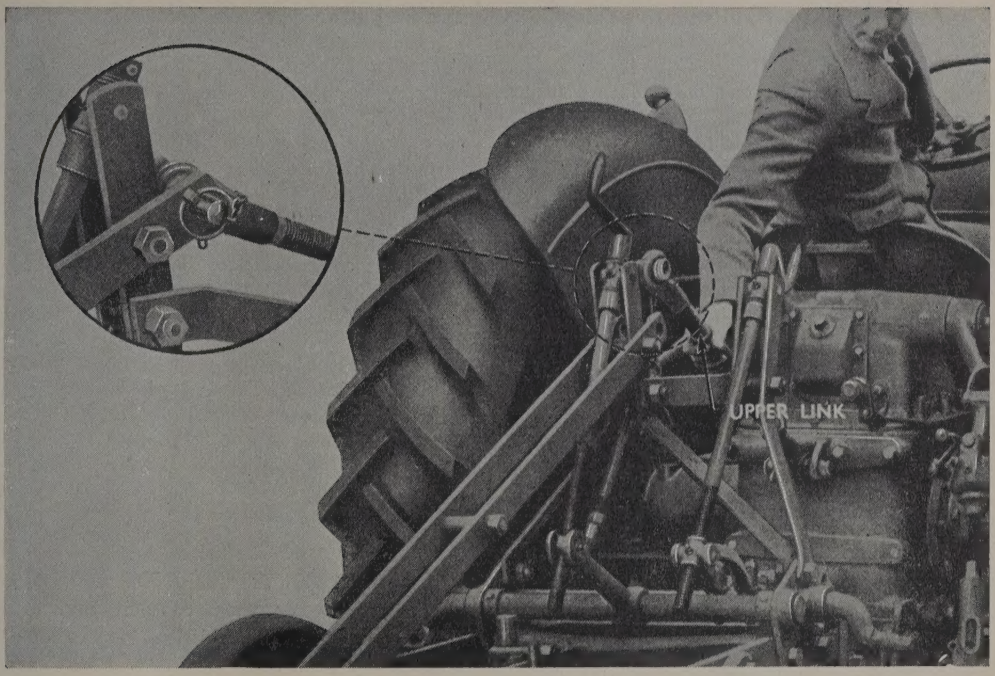


Fig. 2.—Attaching the upper link

flow of oil is controlled to give varying speeds of descent. The slowest descent position is nearer neutral.

Having fixed the appropriate speed for a particular implement, this can be selected automatically by positioning of the thumb screw stop on the control lever quadrant, thereby allowing the control lever to be pushed down only as far as the stop will permit.

WATCH CHECK CHAINS

With the exception of one application, check chains should at all times be slack when an implement is in work. They are not intended to take up the side draft on a plough, for example. Any tendency to pull on the check chains means that the plough is incorrectly set. Constant load on the check chains could result in bent lower links or even a fractured check chain bracket mounting pad.

The purpose of the check chains is to prevent the lower links striking the rear tyres. It is also advisable to tighten them if transporting the implement over a considerable distance in the raised position. This prevents the implement swinging at speed making a driving hazard and also placing strain on the check chains.

The one exception to the rule applies when cultivating crop rows. For this work, the chains should be tight enough to prevent the unit swaying and damaging the crop. It should be borne in mind that this work imposes a comparatively light load, and does not involve side draft.

LIFTING RODS

The lifting rods connecting the lower links to the hydraulic lift lifting arms comprise, broadly speaking, two parts connected by a pin. Provision is made in the lower half of each lifting rod for the pin to connect the two halves rigidly through a hole in both members as shown in Fig. 1 or the telescopic position where the pin can move vertically in a slot in the lower member.

While the former fixed position should be used for all implements having only one depth control wheel—such as ploughs

—the telescopic position should be used on all wide implements, particularly those having two depth control wheels. In the case of the plough, it is essential to have these rods fixed, since the plough relies upon the lower links holding it level to maintain level work. However, in the case of a tine cultivator, the two depth wheels on the implement hold the unit level and there is no necessity for the length of the lifting rods to be fixed.

It is most advisable to utilise the telescopic position for a wide implement, since any lateral tipping of the attached unit due to running over an obstruction, for example, results in great strains being placed on the hydraulic lift arms.

Therefore, ensure at all times when using an implement of this type that the pins are placed in the telescopic position.

ATTACHING PROCEDURE

It is claimed that a mounted implement can be attached in a matter of one or two minutes, a claim occasionally disputed by operators who are unaware of the correct attaching procedure and do not observe the elementary points that can be of assistance.

Firstly the linkage itself. Ensure that the levelling box is always adequately greased and also the threaded portions of the upper link. Always endeavour to park the implement on a level piece of ground. If, for example, the operator wishes to leave the depth-control wheel of a plough in the ploughing position, it is worthwhile, placing a block under the depth wheel to keep the plough horizontal and therefore much easier to attach.

The actual attaching procedure, while being prominently illustrated in the Instruction Books of several of the "Crown" implements, will probably be of value to the operator in possession of other types of mounted equipment.

Therefore, we illustrate here the only correct procedure to adopt.

STEPS TO FOLLOW

With the transport chain disconnected and the tractor in a central position in

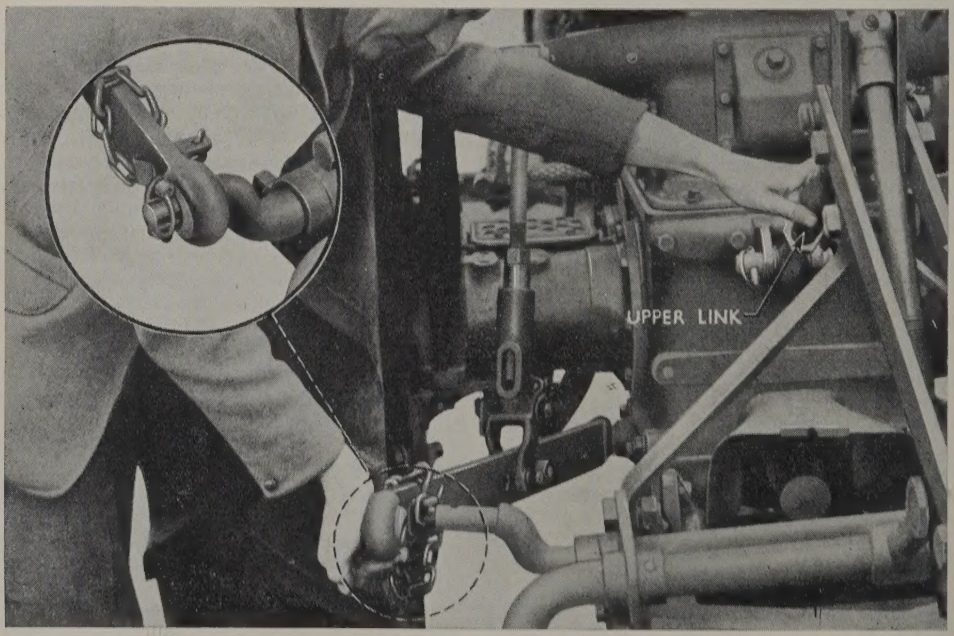


Fig. 3.—Attaching the nearside lower link

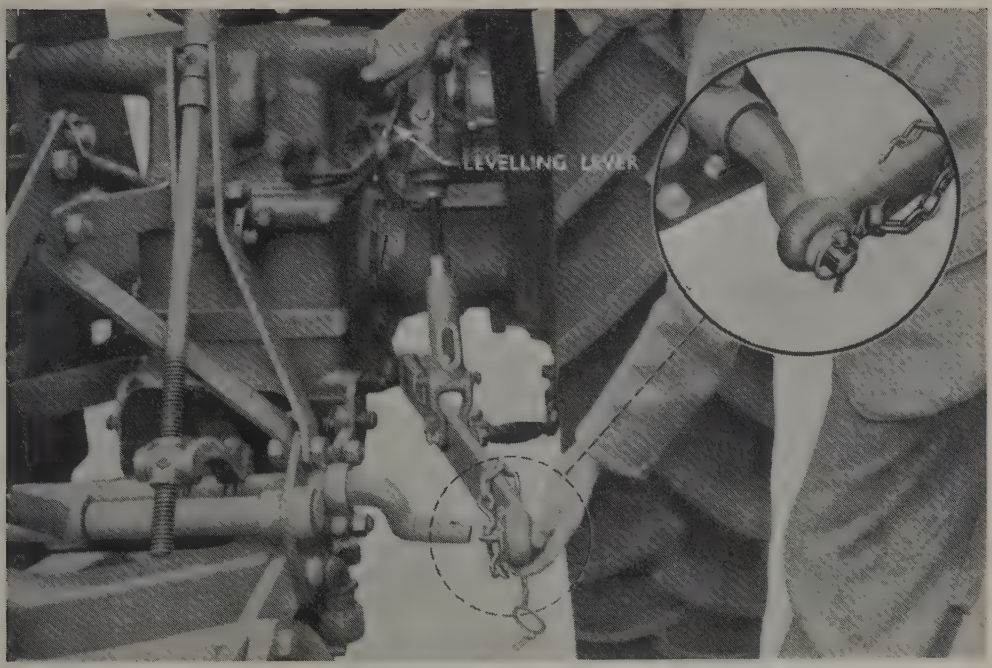


Fig. 4.—Attaching the offside lower link

relation to the implement, reverse the tractor toward the implement, holding the upper link and guiding it between the jaws of the upper link support on the implement. (See Fig. 2).

Before dismounting from the tractor, apply the parking brake, place the gear lever in neutral and operate the hydraulic lift until the left-hand lower link it at the same vertical level as the left-hand hitch pin of the implement.

Upon dismounting, adjust the length of the upper link until the top link pin may be inserted and the linch pin locked in position.

The next step is to adjust the length of the upper link and push the implement away from or draw it toward the tractor until the left-hand lower link that is already in the correct vertical position is brought in line with the left-hand implement hitch pin. The ball point of this lower link may be now attached and the linch pin inserted. (See Fig. 3).

The last step is to attach the right-hand lower link. Any necessity to move the implement away from or to the tractor can be accomplished by use of the adjustable upper link, and any vertical adjustment that may be necessary can be accomplished with the levelling box. (See Fig. 4).

For detaching an implement, the reverse procedure applies.

KEEP PINS FREE FROM RUST

One final point in connection with safe and easy implement mounting concerns the various pins and linch pins. Always ensure that the main pins of the implement and the top link pin are free from rust and corrosion, likewise the holes in the upper link support of the implement.

In the event of loss or damage to the securing linch pins, these should be replaced by new ones and not by bolts and nuts or similar means of securement.

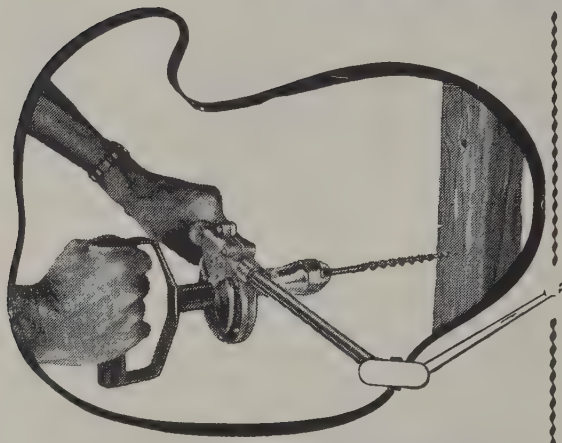
The design of these pins is such that the minimum amount of time is wasted in implement attachment and therefore advantage should be taken of this facility.

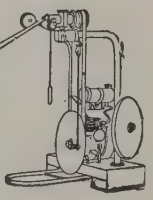
acme POSTBORER

Bores Post Holes in a twinkling

NO costly BITS to buy

Works from any portable shearing machine





. . . it's just br-r-r-r and the bit is through — the "ACME" reduces boring time to a fraction.

Slip off the handpiece of any portable shearing plant—slip on the "ACME" and start boring.

Weighs only 6 lb., compact, easy to handle, uses carpenters' ordinary twist bits (not special expensive bits), geared down to 10 in 1, a speed of 300 revs. a minute . . . . gearing is machine-cut steel worm and bronze worm wheel running in oil in a totally enclosed brass gear case.

Bores up to ½in. holes

Costs only £21/17/6

All timbers bored truly, cleanly and rapidly.

It's an engineering product.

So easy to use, so inexpensive to own.

MALLOCH BROS LTD

WILLIAM ST., PERTH. and at **BUNBURY.**

Fig. 1.—A group of visitors to the 1955 field day at the Gascoyne Research Station.

GASCOYNE RESEARCH STATION

A Progressive Centre

IN 1922, at the request of the Secretary for the North-West Department, Gascoyne Location 125 (49 acres) was reserved as an experimental plot for tropical agriculture. In 1932, the area was re-surveyed to take in portion of an adjourning reserve, bringing the area to 64 acres.

Apart from fencing, very little developmental work was undertaken for a number of years but by 1941, 700 banana plants and a number of other tropical fruits were planted on a small cleared area serviced by an irrigation unit erected on the bank of the Gascoyne River. This was a 7-11 h.p. diesel engine and 2½in centrifugal pump drawing from a 5½ft. diameter concrete cylinder well sunk to a depth of 27ft. in the river sands about 250ft from the bank. At that time there were about 800ft. of concrete channels and 80 spillways of various types being tested.

Originally, the research station was administered by the Horticultural Branch of the Department of Agriculture, but it was transferred to the newly-formed North-West Branch in 1951.

PRESENT ACTIVITIES.

Today, the station has approximately ten acres under cultivation of which seven acres are under bananas.

Other crops being tested include avocadoes, mangoes, pineapples, papaws, citrus macadamia nuts, date and coconut palms, sorghum and lucerne.

Trials with various types of shelter belts —which are very important in banana culture owing to the strong and persistent winds encountered in this area—include athel tamarisk, river gum, pigeon peas, bamboo species, *Leucaena glauca* and two tall banana varieties, the Lady's Finger and the Sugar Banana.

To water the irrigation areas on the Station, up to 1,000,000 gallons of water a week is pumped from five wells in the river

Fig 2.—A young bunch of bananas in one of the trial plots.

sands. The station is fortunate in that these wells give relatively salt-free supplies and, even during long drought periods when pumping has to be maintained for up to 900 hours a month, the supply has never failed.

The Research Station held its first field day in May, 1951, and this was followed by a second field day in May of this year when about 150 local planters and visitors attended.

The second field day was officially opened by the Acting Minister for Agriculture (Mr. L. F. Kelly), who was accompanied by the Director of Agriculture (Mr. G. K. Baron Hay), and the Officer-in-Charge, North-West Branch (Mr. W. M. Nunn).

Addressing the visitors the Director said that although the research station had originally been established primarily for work on banana culture, its scope had been widened and the North-West Branch now had officers engaged on pastoral as well as agricultural problems, with Carnarvon as the headquarters of a team of agricultural scientists working over a wide area.

Mr. Nunn said that although bananas and beans had long been regarded as the principal crops produced at Carnarvon, lucerne was attracting much attention and other crops were being tested.

He felt that there was scope for research work into water usage as at present the bananas were receiving about 4in. weekly or over 17ft. a year. This was more than rice received and he thought that quantities might possibly be reduced without affecting yields.

Visitors inspected the following banana trials which were described by the Tropical Adviser (Mr. J. J. C. Suckling):—

CLOSE PLANTING TRIAL.

Bananas are normally planted on the square 10ft x 10ft. (435 plants to the acre) in the first year. In the second year three suckers or "followers" are left on each plant bringing the number to 1,305 plants.

In the Close Planting Trial the first year plants are planted 5ft x 5ft. x 7ft. giving 1,400 plants to the acre and this is maintained by leaving one "follower" on each plant.

Total production to date from the time the experiment was commenced in 1951 has been higher in the close-planted sections, despite the fact that these sections were severely affected by the cyclone in March, 1953.

LONGEVITY TRIAL.

The initial yields of close-planted areas are naturally better owing to the greater number of plants to the acre.

Production on these trials commenced in January, 1951, using plots of Cavendish and Golden Gros varieties to ascertain whether long-term production was affected by close planting. To date, no diminution of output has been apparent.

After recovery from the cyclone damage Golden Gros yielded at the rate of seven tons to the acre. Cavendish again stood by as a "bad weather friend" and maintained production from March, 1953 (when the cyclone struck) to mid 1954. The

Fig. 3.—Papaw trees with young pineapple plants in the foreground.

Golden Gros produced no fruit during that period and but little during the following six months. Over the life of the plots however the Golden Gros plots have produced nearly three tons to the acre more than the Cavendish plantings.

All plots in this trial received similar manurial treatments, namely, 1 oz. sulphate of ammonia per plant per month up to June, 1950, after which the dressing was increased to 1½ oz. per month. Blood and bone at the rate of 8 oz. per plant was applied during August and January of each year.

NITROGEN TRIAL.

In this trial, which commenced in 1951, dressings of blood and bone at 10 oz. per stool per month; sulphate of ammonia at 4 oz. per stool per month, and whalemeal at 9¼ oz. per stool per month were compared. To compensate for the phosphorus content of the blood and bone and the whalemeal, the sulphate of ammonia was augmented by the addition of 1½ oz. of superphosphate per stool applied quarterly.

To date, the blood and bone appears to be better than either sulphate of ammonia or whalemeal on both the Golden Gros and Cavendish plots. Again, the Golden Gros total production has been higher than that of Cavendish.

COMPLETE FERTILISER TRIAL.

In experiments with nitrogen, phosphorus and potash the records to date would tend to confirm Prof. L. T. H. Teakle's findings that nitrogen is deficient in these soils.

Indications are that potash is also a major deficiency but little conclusive evidence is yet available.

Work involving trials with lime, gypsum and sulphur are as yet not sufficiently advanced to warrant comment.

LUCERNE IRRIGATION TRIAL.

The North-West Branch Agrostologist (Dr. B. Rumich), speaking at the field day and later at a showing of colour slides at the Gascoyne Hotel, described work being carried out at the research station to determine the most economical quantities of water which should be applied to sprinkler-irrigated lucerne plots.

Several types of sprinklers were being tested, and daily, two-daily and weekly applications at different rates were being compared.

Dr. Rumich said that he felt that lucerne-growing was destined to play an important role in irrigated agriculture in the North-West. In the form of baled hay it gave a readily saleable product and it was especially valuable as a soil improver.

Fig. 4.—A seven-year-old coconut palm.

Lucerne-growing increased the nitrogen content of the soil and provided humus which improved the texture and water-retaining properties.

Carnarvon's principal crop, the banana, was highly salt-susceptible. With anything over 40 grains of salt to the gallon, banana-growing became a risky undertaking but good lucerne crops could be produced with water containing almost 200 grains to the gallon.

In the evening, Dr. Rumich showed a number of slides depicting excellent lucerne plots grown on station properties where the irrigation water was carrying between 150 and 200 grains of salt to the gallon.

OTHER CROPS.

For some years, the station has carried experimental plots of pineapples under flood and sprinkler irrigation but no marked success has yet been achieved with these fruits. Yields tended to be low and the fruit was apt to scorch badly during the hot weather.

Work with papaw varieties is proceeding and trial plantings of avocadoes have done well.

Date and coconut palms are under trial, the latter being in their seventh year of growth and coming into production.

Macadamia nuts and citrus have given good yields but marketing conditions are at present unsatisfactory. Sorghum had grown well and a number of vegetables had given good results. A grass garden for plant introduction work has been established on the station and a number of research projects are in hand.

DRAGONFLIES.

Several visitors to the field day asked for information concerning the control of dragonflies which were damaging large numbers of young beans by laying their eggs in the stalks of the plants, causing them to wither.

Agricultural Adviser, H. Suijdendorp said that dragonflies had been very numerous this season but pointed out that the adult insects were not plant eaters but preyed on other insects.

They laid their eggs in water-plants or plants growing near water and, in the case of beans, the "hemstitching" effect caused by the rows of puctures was often responsible for serious damage to the young plants.

The dragonfly larvae lived in water, he explained, and eventually reached the "nymph" stage after which they crawled out of the water and the adult fly emerged from the nymph casing.

Around the station's 63,000 gallon tank, which had recently been drained, Mr. Suijdendorp showed visitors a number of the empty nymph skins just above the former water-level.

He suggested that the most effective method of control would be to kill the larvae in the aquatic stage by covering water in pools and tanks with a thin film of kerosene or other oil.

THE MESQUITE MENACE.

Concern was expressed by several visitors who spoke of the rapid spread of the introduced plant, mesquite, in the Carnarvon area.

Mr. Suijdendorp said that mesquite was hardy and drought-resistant and because it made an attractive shade tree, a large number had been planted in various parts of the North-West.

Mesquite trees bore pods, the flesh of which was rich in sugars, and these were both palatable and nutritious to livestock. The pods contained seeds which were rich in proteins but most of the seeds were so hard that they passed through the digestive tract intact and were distributed far and wide in the droppings of the animals.

Professor W. Phillips, Professor of Botany at the University of Arizona had recently visited Western Australia and he said that in Arizona, where the tree is indigenous, it had suddenly commenced to spread about 50 years ago and had now over-run 9,000,000 out of 15,000,000 acres of that State's desert grassland.

Mesquite forms dense thickets and develops taproots that penetrate to a great depth in search of water. It also forms a mass of surface roots which makes it impossible for grasses to grow near the trees.

Mr. Suijdendorp said that the "explosive" nature of the tree made it particularly dangerous. One station in the Onslow area had six mesquite trees growing on it in 1930. In 1945, the trees suddenly "ran amok" and today there are 36 acres of the property covered with mesquite thickets.

Considerable variation in leaf size and growth habit was noticed among trees growing in the North-West. It was believed that the original introduction were a spineless variety but many had reverted and now carried thousands of sharp spines from ½in. to 3in. long.

A mesquite thicket was a dense mass of spine-armed plants that soon become impenetrable. No time should be lost in eradicating mesquite from the Carnarvon area where it had already become firmly established.

'CUPROX'★

The ready to use copper oxychloride fungicidal spray — Prepared by simply adding to water.

'THIOTOX'★80

A new and outstanding organic fungicidal spray for fruit trees and vines — harmless to fruit, flowers or foliage.

'ZITOX'★80

An 80% Ziram dispersible powder — controls fungous diseases of Fruit and Vines, particularly in zinc deficient areas.

'SULFALOID'★

The easy to mix sulphur spray — its fine particle size ensures stable suspension and maximum fungicidal control.

'LIMESUL'★

A high-grade lime sulphur (available only in N.S.W. and Q'land).

★ *Trade marks of ICIANZ Ltd.*

AVAILABLE FROM

YOUR USUAL SUPPLIER

SAG.26X.4699

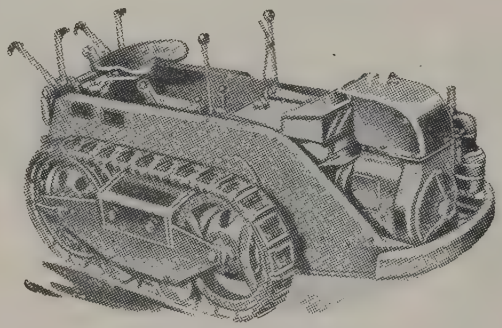
DEPENDABLE PLANT PROTECTION PRODUCTS

IMPERIAL CHEMICAL INDUSTRIES OF AUSTRALIA & NEW ZEALAND LTD

The NEW Improved !

RANSOMES CRAWLER TRACTOR

Now with 3 speeds, longer tracks and full hydraulic lift, 3 point linkage and power take-off



A Mighty Little Machine for Market Gardeners, Poultrymen, Banana Growers, Orchardists, Vignerons, Dairy Farmers, Hop Growers, Celery Growers, and for 101 jobs on even the largest farm

The powerful hydraulic lift and linkage of exclusive Ransomes design has made possible the design and production of important new implements of very much lower cost than drawn implements of similar type

These include Ploughs, Bulldozers, Front and Rear Tool Bars, Frames for Cultivating, Ridging and Hoeing, etc., Disc Harrows, Spraying Outfit, Seed Drill, Rotary Hoe

Has to be seen in action to be believed . . . Manipulates on its own axis . . . Never such ease, speed, economy

WRITE FOR LITERATURE AND ASK US ABOUT A DEMONSTRATION

MORTLOCKS, 914 Hay St., Perth

A STOOL-LADDER for the ORCHARD

A COMBINATION stool and step ladder—a utilitarian, heavy-duty model of a popular item of kitchen furniture—is proving a useful article of equipment in an Eastern Hills orchard.

Mr. R. C. Owen, M.L.A., of Pickering Brook uses these stools extensively when picking fruit, particularly in his stone-fruit orchard where the size of the trees does not warrant the frequent use of a full-sized orchard ladder.

Fig. 1.—The stool-ladder, showing constructional details

Fig. 2.—A handy support for the picking box

When picking from the lower branches, the stool holds the picking box at a convenient height, leaving both hands free. For the higher branches, the step-ladder gives sufficient elevation for a medium-sized tree.

CONSTRUCTION

The stool stands about 30in. high and is made from pine timber for lightness.

Four pieces of 3½ x ¾in. timber are nailed together in the form of a 10in. square box frame upon which the top of the stool is screwed. The sides and back

end of the box are sloped outward at the bottom to permit the legs to be splayed in order to give a firm base. The top edges are then planed level to take the top of the stool which is about 11in. square.

Alternatively the box could be made with perpendicular sides and the tops of the legs could be made slightly wedge-shaped to allow them to be attached at an angle.

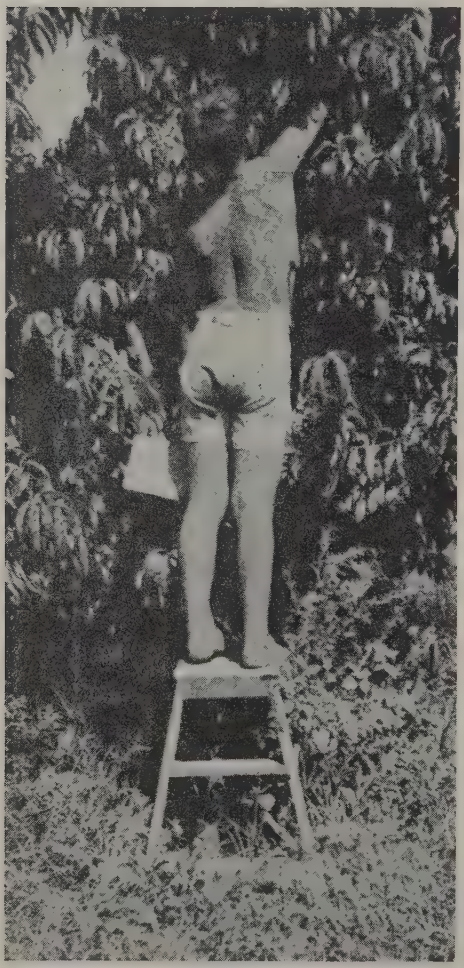


Fig. 3.—In use as a ladder

The legs and the two steps are of 3½ x ¾in timber. The legs are bolted in position, the steps being housed in grooves cut on the inside faces of the legs.

Added strength and rigidity are given by three lengths of ½in. round steel, threaded at each end and fitted with nuts and washers. These are 12in., 16in. and 20in. long, respectively, and go under the top and under the two steps.

Further bracing is provided by two stays 22in. long made from 2½ x ¾in timber. The ends of the stays are shaped so that they fit snugly against the inner faces of the two front legs and the outer edges of the single back leg.

When standing on the stool, care should be taken to distribute the weight evenly, and preferably towards the face of the stool where the two legs are attached. Stepping on the back corners is liable to make it tip sideways.—J.M.

DEEP FROZEN BOVINE SEMEN

A further consignment of 250 cc. of deep frozen Dairy Shorthorn bull semen contained in 1 cc. ampoules reached Perth by air from London on April 27.

This was imported from the Cambridge and District Cattle Breeders Ltd., of Great Britain, by Mr. M. J. Edwards, Veterinary Surgeon of Bunbury, for the artificial insemination of the dairy herd of Mr. H. Burge at Busselton.

The semen was packed in a thermos flask containing about 10 lb. of dry ice and arrived in good condition; a microscopic examination of one of the ampoules revealing the sperms to be actively motile.

As a precaution against foot and mouth disease it will be required to be held in quarantine for a period of 30 days from the date of collection and will not be released to the importer until a quarantine clearance has been received from the Ministry of Agriculture and Fisheries, Great Britain.

Until the semen is required for use it must be maintained at a temperature of minus 79° Centigrade and this will be effected by the addition of dry ice to the flask as required.

INSECT Pests AND THEIR CONTROL

By C. F. H. JENKINS, M.A., Government Entomologist

APPLE BLEMISHES – THEIR CAUSES AND HOW TO CONTROL THEM

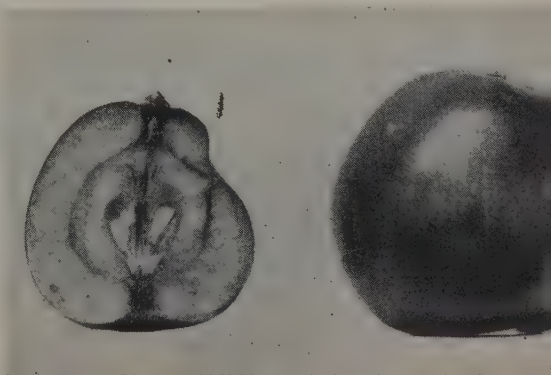
EVERY year apple growers lose a certain amount of fruit due to superficial blemishes caused by different types of insects. The injuries vary from conspicuous, corky scars to small spots and dimples. Several types of caterpillars and beetles are known to produce feeding scars of various kinds, but the cause of the dimpling found so frequently in Granny Smiths and, to a lesser extent, in some other varieties is still not known.

Comparable injury is caused to many different fruits by various plant-sucking bugs and aphis (Woodside 1950) but thrips activity is regarded by many growers as the cause of apple dimpling. There seems little doubt that a sap-sucking insect is involved and that the injury is caused at a very early stage in the development of the fruit but this does not necessarily implicate the thrips. A study of thrips activity over a period of many years has failed to reveal any definite correlation between the number of insects present at blossoming time and the incidence of apple dimpling. That some sucking pest causes the injury, however, is supported by the fact that the dimples can be induced artificially by puncturing the developing fruit at petal fall with a finely drawn glass thread (R. C. Owen, unpublished) and that the use of suitable insecticides will eliminate the trouble.

Comparable injury, though perhaps caused by a different insect, has been reported from other Australian States, and it is interesting to note that DDT sprays have been successfully used by growers in New South Wales and Western Australia to reduce apple dimpling. (Anon 1951).

The first large scale field trial with DDT for the control of "dimpling" was carried out by Mr. H. Price of "Illawarra" orchard, Karragullen. A spray consisting of 0.1 per cent. DDT was applied with power equipment on September 28, 1950, just before bud-burst and samples from sprayed and unsprayed trees were examined by entomologists between November 29 and December 3. In all, 40 trees were sampled and 120 apples were taken from each tree. The sampling showed that fruit dimpling

Fig. 1.—An apple showing dimple-like depression on side; also a section through the fruit showing how growth is retarded at point of injury.



and various blemishes caused by chewing insects such as caterpillars and beetles were greatly reduced by the treatment.

A second field trial, similar to that just described, was conducted on Messrs. Brindle Bros. property at Parkerville, in 1953. The results substantiated the findings of the earlier test and the degree of control obtained in both trials is revealed in the following table:—

Locality.	Type of Injury.	Per cent. Damaged Fruit on Sprayed Trees.	Per cent. Damaged Fruit on Unsprayed Trees.
Karragullen	Dimpling	12	49
	Chewing	2½	12½
Parkerville....	Dimpling and chewing combined	3	22½

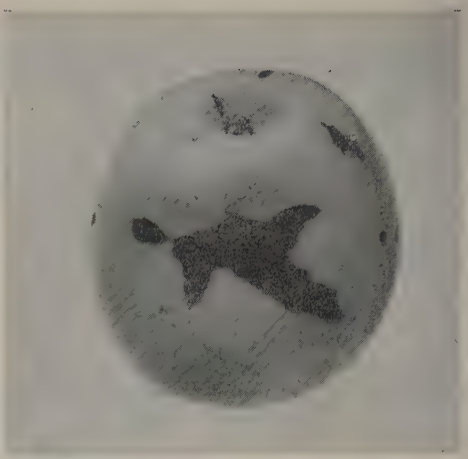


Fig. 2.—Apple showing skin injury caused by some chewing insect.

General observations in other orchards have substantiated the results of the trials just described and indicate that an early spring spray with DDT will greatly reduce various types of apple blemish.

Although it has not been possible to directly associate thrips numbers and apple dimpling, there is evidence to show that high thrips numbers may affect apple setting (Andrewartha & Kilpatrick 1951). This view has been further strengthened by the fact that thrips have been checked by an application of DDT in September and that increased setting has been claimed by many orchardists following such a treatment.

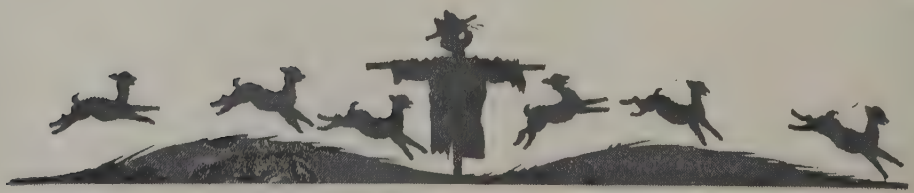
In some districts and in certain seasons the September DDT treatment may be a little early to prevent damage from looper caterpillar, leafhopper, spring beetle, etc., later in the season. Action against these pests is normally taken in late October or early November. Although in light years the early treatment may prove adequate, conditions should be watched carefully and a later treatment should be applied if insect activity appears dangerous.

REFERENCES

Andrewartha, H. G., and Kilpatrick, D. T. (1951).—The apple thrips. *J. Dep. Agric. S. Aust. 54:* 586.

Anon (1951).—Cause of dimpling in apples. *Agric. Gaz. N.S.W. 62:* 588.

Woodside, A. M. (1950).—Cat-facing and dimpling of peaches. Bull. Virginia. Agric Exp. Sta. No. 435.



LIST OF DEPARTMENTAL PUBLICATIONS

THE following publications may be obtained from the Department of Agriculture, St. George's Terrace, Perth. Except where a price is specifically stated, leaflets are supplied free of charge. The Department cannot supply leaflets to individual school pupils for use in compiling projects, but where an approach is made by the Principal or Headmaster, copies will be supplied for use in school libraries.

BEE-KEEPING

697 Introduction of Queens.
740 Management of an Apairy.
829 Migrating Bees.
1005 Bee Combs.
1099 Control of Swarming.
2010 Raising Queen Bees.
2016 Evicting Bees from Houses.
2043 Bees and Honey.
2052 Diseases of Bees.

CATTLE

757 Dehorning.
875 Strain 19 for the Control of Contagious Abortion.
963 Blackleg in Cattle.
1058 Tuberculosis.
1085 More Beef from the Kimberleys.—Part 1.
1099 More Beef from the Kimberleys.—Part 2.
1095 Strain 19.
1099 Cattle-working Yards.
1099 A Hospital Paddock.
2000 Actinomycosis and Actinobacillosis.
2000 Vibriosis recorded in South-West Herds.
2012 Internal Parasites of Cattle.
2016 Diseases of Dairy Cattle.—Internal Parasites.
2022 Diseases of Dairy Cattle.—Warts and Eye Cancer.
2022 A Simple and Effective Cow Bail.
2023 List of Stock Foods.
2034 The Shorthorns.
2065 Identical Twins.
2071 Milk Fever in the Dairy Cow.
2072 Tetanus in Farm Animals.
2092 A Simple Method of Throwing Cattle.
2097 The Spaying of Cattle.
2108 Diseases of Goats.
2109 Castration of Calves and Pigs.
2121 Infectious Keratitis (Pinkeye) in Cattle.
2181 Genetics and Animal Breeding.
2211 A Crush for the Tuberculin Testing of Cattle.
2213 Acetonaemia in Dairy Cows.
2217 Foot Rot (Foul Foot) of Dairy Cattle.
2227 Copper and Cobalt Deficiency of Livestock in W.A.

HORSES

417 Determination of Age in the Horse.
1071 Internal Parasites in Horses.

DAIRYING

968 Cooling of Milk
970 Butterfat Ready Reckoner.
971 Artificial Insemination.
982 Influence of Month of Calving on Production.
986 Influence of Month of Calving on Length of Lactation.
987 The Farm Separator.
990 Grade Herd Recording.
1000 Rate of Milking with Machines.
1036 Dairy Herd Improvement Scheme.
1050 Register of Merit.
1055 Cost of Feeding Pure Bred Dairy Cows.
1059 Dairy Herd Improvement Scheme, 1950-51.
2034 The Shorthorns.
2058 Layout of Dairy Premises.
2060 Rearing Calves on Ten Gallons of Milk.
2065 Identical Twins.
2077 We Need More Silage.—Part 1.
2088 We Need More Silage.—Part 2.
2101 We Need More Silage.—Part 3.
2090 Goat-keeping for Beginners.
2106 Better Dairying Competition, 1952-53.
2112 How to Produce Clean Milk.
2132 The Babcock Test for the Estimation of Butterfat in Milk and Cream.
2163 Results of Official Pure-Bred Herd Recording Scheme, 1951-52, 1952-53.
2193 Cream Tests and Butter Quality.
2203 Milking Machine Development.

FARM AND HOME

2001 The Farm Breakfast; Meringued Apples; Plastics in the Kitchen.
2016 Hay-Box Cookery.
2022 Making the Most of the Christmas Poultry.
2086 The Preparation of Show Exhibits; Beds and Bedding; Hot-Pots; Cleaning Silver.
2104 Some Suggestions for the Christmas Sweet Course; Shoe-Bags for Holidays; Cake-making Hints; A Dry-cleaning Hint.
2117 Jams and Jellies for Exhibition.
2135 Some Ideas in Plastic; Meet "Needle Nell".
2179 Cake Icing for Beginners.
2197 Icing a Sponge; Cleaning White Kid Gloves.
2236 Summer Desserts; A Basket from a Millinery Hood.

FLOWERS AND GARDENING

2003 Plant Your Roses Carefully.
2003 Dahlias—Lifting and Storing Tubers.
2009 Entyloma Leaf Spot of English Marigold.
2010 The Winter Pruning of Roses.
2019 Lawns.
2019 Daffodils for Everyone.
2021 Black Rot of Stocks.
2031 The Glorious Gladiolus.
2044 Plant Diseases—Corm Rots of Gladioli.
2054 The Preparation of Rose Beds.
2089 Some Lovely Roses.
2118 The Budding of Roses.
2158 The Cultivation of Chrysanthemums.
2175 Pot Plants for Interest and Enjoyment.
2218 The Exquisite Camellia.

FRUIT-GROWING

191 Citrus Pit.
219 Bitter Pit.—Occurrence in Store in Relation to Date of Picking.
306 Black Spot or Scab of Apples.
327 Wine Making.
380 Black Spot or Scab of Pears.
542 Papaw or Papaya.
653 Citrus Growing.
750 Soil Moisture Conservation—Vineyards and Orchards.
764 Preservation of Fruit.
833 Citrus Tree Pruning.
863 Withertip of Apples.
889 Banana Culture.
912 Incinerator.—For Destruction of Fruit with Fruit Fly.
935 Apple Scab Outbreaks, 1947-1948.
945 Root Knot or Eelworm Gall Disease.—Control by Soil Fumigation with D.D.
951 Pre-harvest Drop of Apples and Pears.

1028 Notching of Dormant Buds on Apple Trees.
1045 Spraying to Control Pre-harvest Drop in Washington Navel Oranges.
1068 Storage of Stone Fruit.
1092 A Novel Farm-made Spray Outfit.
1099 A Device for Applying Orchard Fertiliser.
2000 Reduction of Pre-harvest Drop of Washington Navel Oranges by 2,4-D Sprays.
2001 Cultivation of the Cape Gooseberry.
2014 A Successful Method of Spraying Against Looper Caterpillars.
2014 Raising Japanese Plum Trees from Cuttings.
2015 Thinning of Deciduous Fruit Trees.
2018 The Passion Fruit.
2021 Crown Gall of Fruit Trees and Other Plants.
2033 Scald in Granny Smith Apples.
2037 The Pruning of Fruit Trees.—Part 1.
2051 The Pruning of Fruit Trees.—Part 2.
2076 The Pruning of Fruit Trees.—Part 3.
2122 Fruit Fly Control.—A Jeep-operated Spraying Outfit.
2180 The Preparation of Fruit for Marketing.
2206 The Effectiveness of 2,4-D in Preventing Drop of Washington Navel Oranges.
2235 Loss in Weight of Stored Jonathan Apples.

GRAIN CROPS

745 Maize for Grain.
841 Wheat Breeding in Australia.
885 Handling Feed Wheat in Bulk.
953 Yield and Flour Strength of Wheat.
961 Oats in the Wheat Belt.
1048 A Calendar of Farming Operations.
2003 1951-52, 50 Acre Wheat Crop Competitions.
2003 New Cereal Varieties in Australia.
2020 Pedigree Seed of Wheat, Oats and Barley.
2039 Wheat Variety Trials on Research Station, 1952.
2040 New Cereal Varieties in Australia.
2159 Wheat Variety Trials on Research Stations, 1953.
2174 Oats and Barley Varieties in W.A.
2185 New Cereal Varieties in Australia.
2199 Stock Foods.
2221 Vetch Species Trial.
2229 Maize Grain Trial.

INSECT PESTS

122 Codling Moth.
179 Green Tomato Bug.
270 The Subterranean Clover Weevil.
299 A Blow-fly Parasite.
325 Apple Curculio.
396 San Jose Scale.
639 Stored Grain Pests.
647 Trapping Blowflies.
648 Control of Weevils in Wheat.
712 Cabbage Butterfly.
754 Thrips.
762 Red Spider.
773 Clothes Moths and Carpet Beetles.
780 Bed Bugs.
792 Vegetable Weevil.
811 Some Household Pests.—Dried Fruit and Meal Insects.
812 Pear Slug.
820 Entomological Problems. Ord River Irrigation Area.
836 DDT. as an Agricultural Insecticide.
847 Grasshoppers and Locusts.
879 Experiments with DDT. and 666.
882 Codling Moth.
941 The Argentine Ant.
943 The Banana as a Host Fruit for Fruit Fly.
962 Argentine Ants. An Experiment in Control.
1007 Apple Leafhopper. Its Control at Donnybrook.
1008 Trials with New Insecticides in Fruit Fly Control.
1023 Climbing Cutworm or Tomato Moth.
1025 The Pea Weevil.
1060 Argentine Ant.
1077 Insect Pests and their Control.
1088 The Web-worm.
1092 A Novel Farm-made Spray Outfit.
2001 Snails and Slugs.
2001 Oriental Fruit Moth.
2009 The Red-legged Earth Mite.
2011 Control of Mealy Bug in Vines.
2014 A Successful Method of Spraying against Looper Caterpillars.
2015 Aphides.
2021 Fuller's Rose Weevil.
2021 The Insect Vector in Relation to Myxomatosis in Australia.
2027 The Citrus White Fly.
2045 New Insecticides for the Control of the Argentine Ant in Western Australia.
2047 The Citrus Red Scale.
2055 The Black Beetle.
2083 Cut Worms.
2094 Recent Investigation into Grasshopper Control in W.A.
2095 Fighting the Argentine Ant.
2103 White Wax Scale.
2115 Vine Leaf Blister Mite.
2127 The Cabbage Moth.
2144 Lucerne Flea.
2145 Termites or White Ants.
2156 New Insecticides for Fruit Fly Control.
2188 Potato Moth.
2205 Fleas, and their Control.
2230 Climbing Cutworm.

IRRIGATION

220 Irrigation.
1066 An Automatic Windmill Shut Off.
1073 More Automatic Windmill Shut Offs.
1099 Dams on Hillsides.
2114 How to get the Best Results from Centrifugal Pumps.
2125 Water for Agricultural Purposes.
2177 Treating Hard Water.
2191 Permanent Structures for Irrigation Farms.
2204 A Novel Tank Indicator Gauge.

MANURES AND PLANT NUTRITION

323 Leguminous Crops and Soil Fertility.
508 The pH Scale.
662 Conserve Nitrogenous Fertilisers by Growing Inoculated Legumes.
671 Compost.
676 Gypsum.
679a Legumes for Green Manuring.
695 Farm Manure.
710 Superphosphate Requirements for Wheat.
737 Experiments on the Effect of Adding Ground Limestone and Slaked Lime to the Superphosphate used for Wheat Growing.
750 Soil Moisture Conservation in Vineyards and Orchards.
803 Copper Deficiency. (With reference to the establishment of sub-clover.)
824 Phosphatic Fertilisers.
843 Cobaltised Superphosphate.
878 Fertilisers for Lettuces.
927 Copper Deficiency of Cereal.
936 Zinc Deficiency of Flax.
956 Molybdenum. For Prevention of Whiptail in Cauliflowers.
983 Fertiliser Trials. On Annual Pasture. Wokalup Research Station.
996 Zinc. For Sub-clover at Kendenup.
1045 Spraying to Control Pre-harvest Drop in Washington Navel Oranges.
1054 *Paspalum Vaginatum* or Sea Shore Paspalum.
1074 Kimberley Soils need Phosphates.
2020 The Regeneration and Maintenance of Wimmera Ryegrass under Saline Soil Conditions.

MISCELLANEOUS

93 Home Tanning of Skins.
816 Canine Distemper.
994 The Branding of Stock.
1061 A Useful Light Grading Implement.
1066 An Automatic Windmill Shut-off.
1073 More Automatic Windmill Shut-offs.
2000 Farm Fencing Hints.—Strainer Posts and Fence Patterns.
2013 Farm Fencing Hints.—Straining the Wires.
2019 Farm Fencing Hints.—Gates and Gadgets.
2066 Farm Fencing Hints.—Running Barbed Wire.
2004 Farm Fencing Hints.—Boring the Posts.
2004 Training a Sheep Dog.
2006 Shearing Time.
2006 Gascoyne Research Station's First Field Day.
2013 Tree Lucerne.
2013 Fire Hazard Forecasts for Farmlands.
2015 Muresk Agricultural College.
2016 Seasonal Reminders for November-December.
2020 Checking Run-off on Cultivation.
2022 A Simple and Effective Cow Bail.
2046 Make the Best Use of Your Rainfall.
2102 A Farm Made Buckrake or Hay-sweep.
2116 Clearing Scrub Re-growth.
2139 Protection of Survey Marks.

2134 List of Departmental Publications.
2136 Ropes, Knots and Splices.
2141 Protection of Birds and Animals.
2147 The Kimberley Project.
2148 Agricultural Extension in the North-West and Kimberley.
2164 The Care and Maintenance of the Farm Tractor.
2178 Claypans in the North-West Spinifex Areas.
2184 Muresk Agricultural College.
2186 Farm Butchering.
2187 Can a Blackfellow Do It?
2189 The Care and Maintenance of Binders.
2194 Station Management.—The Value of Deferred Grazing.
2198 The Wallaby Menace in the Kimberleys.
2202 Park Land Clearing.
2204 A Tank Indicator Gauge.
2208 A Handy Drum Tipping Cradle.
2216 Preparing and Using Rawhide.
2224 Some Points on Paints and Painting.
2226 Wheel Slip in Tractor Operations.

OIL-SEED AND FIBRE CROPS

641 Flax for Fibre.
765 The Soybean. Inoculation Experiments.
799 Broom Millet.
855 Flax Rust.
872 Flax Seed Treatments.
877 The Soybean.
936 Zinc Deficiency of Flax.
966 Sunflowers.

PASTURES AND FODDERS

323 Leguminous Crops.
497 Tangier Pea.
546 Pasture Development.
584 Subterranean Clover. Influence of Methods of Planting on Establishment.
591 *Phalaris Tuberosa.* Toowoomba Canary Grass.
592 Tangier Pea.
599 Meadow Hay.
602 Small-seeded Horse, or Tick Bean.
634 Lucerne Growing in W.A.
678 Copper Content of W.A. Pastures.
692 Pasture Development. Part III.
708 Early Sub-clover Pastures. For Areas of Medium Rainfall
798 Cow Peas.
819 Paspalum Grass.
910 Leguminous Seeds. Composition and Food Value and Vetches.
938 Kikuyu Grass.
966 Sunflowers.
1018 Maize.
1031 First Early Subterranean Clover.
1082 Elephant Grass.
2020 The Regeneration and Maintenance of Wimmera Ryegrass Under Saline Soil Conditions.
2032 The Testing of Bacterial Strains used in Legume Cultivation.
2079 Problems of the Spinifex Areas.
2080 Buffel and Birdwood Grasses.
2111 Buffel Grass.—What it has done for Mundabullangana.
2100 Fodder Conservation in the Kimberleys.—Part 1.
2087 Fodder Conservation in the Kimberleys.—Part 2.
2219 Kapok Bush.
2231 Buffel Grass.

PIG HUSBANDRY

2048 Pig Raising as an Adjunct to Dairy Farming.
2062 Infectious Pneumonia of Pigs.
2073 Swine Paratyphoid (Salmonellosis-Necrotic Enteritis).
2109 Castration of Calves and Pigs.
2124 Preventing Pig Losses.
2129 Sarcoptic Mange of Pigs.
2140 Whale By-products for Pig Feeding.
2182 Suppurative Otitis in Pigs.
2183 Worms in Pigs,
2200 De-tusking of Boars.

PLANT DISEASES

121 Mildew, Septoria, and Leaf Spots of Cereal.
126 Stem Rust of Wheat and Barley.
219 Bitter Pit.—Occurrence in Store in Relation to Date of Picking.
228 Root-rot, Foot-rot and Take-all of Cereals.
306 Black Spot or Scab of Apples.
379 Frost Injury of Wheat.
380 Black Spot or Scab of Pears.
672 Grey Mould or Botrytis Rot of Apples.
677 Water Spot of Navel Oranges.
719 Bean Rust.
721 Blossom End Rot of Tomatoes.
817 Bean Mosaic Menace.
818 Sclerotinia Twig Blight of Oranges.
867 Bacterial Canker of Tomatoes.
886 Leaf Spot Diseases of Black Mulberry.
935 Apple Scab Outbreaks, 1947-1948.
945 Root Knot or Eelworm Gall Disease. Control by Soil Fumigation with D.D.
946 Stem Rust of Wheat. Autumn Rainfall in Relation to Spring Epidemics.
979 Powdery Mildew or Oidium of Grapes.
1024 Bordeaux Mixture.
1044 Vegetable Seed Treatments.
1063 Westralia. A New Rust-Resistant Pole Bean.
1089 Plant Diseases. Brown Rot of Citrus.
1090 Collar Rot or Brown Rot Gummosis of Citrus Trees.
2009 Hormone Weedicide Injury to Grapevines.
2009 Peach Leaf Curl.
2009 Shot-Hole of Stone Fruit.
2009 Late, or Irish Blight of Potatoes.
2011 The Control of Mealy Bug on Vines in W.A.
2015 Lettuce Mosaic.
2028 Black Spot or Early Blight of Tomatoes.
2047 The Citrus Red Scale.
2056 Early Blight of Potatoes.
2057 Black Spot of Grapes.
2084 Spotted Wilt of Tomatoes.
2105 Black Spot or Early Blight of Tomatoes.
2116 Early Blight of Potatoes.
2128 Cucumber Mosaic.
2155 Cereal Smut Diseases and Their Control.
2171 Black Spot (Anthracnose) of Grapes.
2214 Ascochyta Blight of Peas.

POULTRY-KEEPING

874 Animal Breeding.
876 Produce and Market First Quality Eggs.
940 Requirements in Designing the Layout and Buildings for a Poultry Farm.
949 The Culling of Poultry.
995 Nutritional Requirements of the Domestic Fowl.
1010 Geese.
1035 Raising Turkeys.
1041 The Control of Intestinal Roundworms in Poultry.
1057 Muscovy Ducks.
2001 Incubator Hygiene.
2002 Planning Boosts Poultry Profits.
2007 Hints on Chicken Rearing.
2013 Teaching Chickens to Perch.
2025 Thin-Shelled Eggs.
2026 Pullorum-Tested Flocks.
2069 Some Poultry Pests.
2074 Infectious Laryngo-Tracheitis.
2120 Dep Litter for Poultry.—Part 1.
2154 Deep Little for Poultry.—Part 2.
2138 Blackhead in Turkeys.
2157 The Rearing of Chickens.
2168 Coccidiosis of Fowls.
2190 Infectious Sinusitis of Turkeys.
2212 Antibiotics in Poultry Nutrition.
2232 Leucosis in Fowls.

SHEEP HUSBANDRY

623 Coast Disease.
646 Experiments in the Feeding of Phosphorous Supplements to Sheep in Western Australia.
656 Infectious Entero-Toxaemia.—Braxy-like Disease, Pulpy Kidney.
682 Stringy Wool and Copper Deficiency.
686 Arthritis in Lambs.
713 Copper Deficiency in Sheep.
763 Mycotic Dermatitis (Lumpy Wool) and Fleece Rot.
830 Caseous Lymphadenitis (Cheesy Gland).
844 Photosensitisation.
858 Cystic Tapeworms (Bladder Worms).
874 Animal Breeding.
895 Flock Establishment and Improvement.
917 Studies in Sheep Husbandry.
930 Export Lambs.—Grading Standards.
944 Classing Farmers Clips for Auction.
950 Sheep Itch Mite.

974 Clover Disease.
981 Lice and Tick in Sheep.
984 Sheep-Shearing Technique.
985 Urinary Calculi.
1056 Hypocalcaemia (Milk Fever, Grass Tetany) in Breeding Ewes.
1075 Aids to Better Shearing.
1091 Sheep Crutching Technique.
1098 "Swelled Head" in Rams.
2013 Shearing Shed Design.
2024 Mulesing and Tail Stripping.
2036 Worms in Sheep.
2049 "Scabby Mouth" in Sheep.
2068 Toxic Paralysis (Botulism) of Farm Animals.
2078 Rearing Orphan Lambs.
2099 Footrot in Sheep.
2126 Footrot in Sheep.—Part 2. The Need for Summer Treatment.
2137 The Breeding of Farm Animals.
2162 Pregnancy Toxaemia of Ewes.
2172 Colbalt for the Control of Wasting Disease.
2176 Vitamin A Supplements for Sheep.
2220 Nutrition and Disease.
2209 Contagious Ophthalmia (Pinkeye) of Sheep.
2227 Copper and Cobalt Deficiency of Livestock in W.A.
2228 Clover Disease.
2233 Lice and Tick in Sheep.
2234 Shearing Schools.

SOIL CONSERVATION

908 Soil Conservation.
947 Wind Erosion.
955 Water Erosion.
1003 Salt Problems in the West Australian Wheatbelt.
1004 Windbreaks and Shelter Belts in Relation to Soil Erosion.
1052 Soil Salinity Investigations.
1054 Paspalum Vaginatum or Sea-shore Paspalum.
1079 Soil Conservation in Western Australia.
1094 Water Erosion Control.—Part 1.
2002 Water Erosion Control.—Part 2.
2005 Water Erosion Control.—Part 3.
2014 Water Erosion Control.—Part 4.
2020 Water Erosion Control.—Part 5.
2005 Soil Conservation Farming.
2014 The Hose U-Tube Level.
2014 Soil-Saving Schools.
2020 The Soil Conservation Service.
2030 Wind Erosion Control.
2042 Contour Furrows Increase Pasture Growth.
2046 Make the Best Use of Your Rainfall.
2096 Soil Analyses.
2133 Roads Erode.

TREES

561 The Tung Oil Tree.
977 Trees for the Wheatbelt.
1078 Karri (*E. diversicolor*) Jarrah (*E. marginata*).
1096 Tuart (*E. gomphocephala*); Illyarrie (*E. erythrocorys*).
2007 Salmon Gum (*E. salmonophloia*); Scarlet Pear Gum (*E. Stoatei*).
2013 Tree Lucerne.
2015 Gimlet Trees (*E. salubris* and *E. campaspe*); Pear-Fruited Mallee (*E. pyriformis*).
2020 Swamp or Flat-Topped Yate (*E. occidentalis*); Brown Mallet (*E. astringens*); Four-Winged Mallee (*E. tetraptera*).
2029 Coral-Flowered Gum (*E. torquata*); Lemon-Flowered Gum (*E. Woodwardii*); White Mallee (*E. erythronema*).
2038 Coolabah (*E. microtheca*); Grey Box (*E. tectifica*).
2064 *E. oleosa*, Red Tingle (*E. Jacksonii*).
2082 Red Box or Gum-Barked Coolabah (*E. interexta*); Forrest's Mallee (*E. Forrestiana*).
2123 Dundas Mahogany (*E. Brockwayi*); Round-Leaved Mallee (*E. orbifolia*); Gungunnu (*E. caesia*).
2151 Marri (*E. calophylla*); Spring Bloodwood (*E. ptychocarpa*); Twin-Leaved Bloodwood (*E. perfoliata*).
2169 Four Northern Bloodwoods (*E. setosa*); (*E. zygophylla*); (*E. ferruginea*) and (*E. abbreviata*).
2195 Woollybutt (*E. miniata*) and Gnaingar (*E. phoenicea*).

TOBACCO

1065 Cultivation of Tobacco in Western Australia.
2011 The Prevention of Sucker Growth in Tobacco After Topping.
2093 Tobacco Growers' Problems.
2160 Tobacco Seedling Production.
2161 Fertiliser Applications for Tobacco Seed Beds.
2173 The Control of Tobacco Pests in W.A.
2210 The Behaviour of Tobacco Varieties in W.A.

VEGETABLE GROWING

179 Green Tomato Bug.
292 Cultivation of Onions.
712 Cabbage Butterfly.
732 Black Spot and Stem Rot of Peas.
734 Chocolate Spot of Broad Beans.
754 Thrips.
762 Red Spider.
777 Vegetable Growing. (2/- per copy.)
779 Snails and Slugs.
792 Vegetable Weevil.
793 Tomato Culture in the Geraldton District.
836 DDT. as an Agricultural Insecticide.
865 Vegetables. Selecting for Seed Production.
878 Fertilisers for Lettuces at York.
879 DDT. and 666 Experiments.
956 "Whiptail" in Cauliflowers. Use of Molybdenum.
1030 Some Facts and Suggestions in Connection with the Grading of Potatoes.
1023 Climbing Cutworm or Tomato Moth.
1025 Pea Weevil.
2003 Potato Harvesting Machines.
2131 Peanut Growing on the Levee Soils of the Gascoyne River.
2188 Potato Moth.

VERMIN CONTROL

438 Vermin Poisoning.
1051 The Destruction of Rabbits, Emus, Eagles, Rats, Mice.
1099 On the Trail of the Dingo.
2023 Wild Dog Investigations—Warburton Ranges, 1952.
2035 Wild Dog and Dingo Destruction.—Part 1.
2061 Dingo Destruction.—Part 2.
2053 The Wallaby Menace in the Kimberleys.
2067 Poison Trails for Rabbit Destruction.
2081 Dingo and Wild Dog Destruction.—Part 3.
2110 Humane Trap for Vermin.
2113 Aerial Baiting Against Wild Dogs and Foxes in W.A.
2150 Warren-Ripping Innovation.
2201 Dingo and Wild Dog Destruction.—Part 4.
2215 A Kangaroo Disease.
2222 Rabbit Control with "1080".
2223 Wild Dogs and Dingoes in Western Australia.

WEEDS AND POISON PLANTS

103 Zamia Palm.
158 The Common Thornapple.
310 Wild Turnip.
330 Chemical Weed Killers.
441 Skeleton Weed.
528 Tree Balsam or Gascoyne Poison.
657 Four New Noxious Weeds.
688 Poison Plants of the Gascoyne Stock Route.
884 Trials with Selective Weed-Killers.
893 Bathurst Burr.
934 Ragwort.
978 Noogoora Burr.
1047 Large-Scale Chemical Weed Control in Crops.
1076 Piturl.
2002 Hydrocyanic Acid Poisoning from Poison Rush.
2008 Oxylobium and Gastroloblum Species.
2009 Poison Sedge and Cyanogenesis.
2015 The Wedge-Leaved Rattlepod.
2019 Growth-Regulating Substances Used for Weed-Killing.
2022 The Distribution of Some of the More Important Toxic Plants of South-Western Australia.
2022 The Cape Tulip.
2041 The Thorn Apples.
2050 Crop Spraying with Hormone Like Weedkillers.
2059 Bracken Fern Control.
2085 Euphorbia.
2149 Cape Tulip.
2152 The Chemical Control of Wild Radish.
2153 The Native Pear as a Toxic Plant.
2165 Ironwood.
2167 Mexican Poppy.
2170 Some Chemical Trials with Doublegee.
2192 Water Hyacinth.
2196 The Birdsville Indigo.
2207 Caltrop.
2225 Noogoora Burr.

SOURSOB

(*Oxalis pes-caprae* L.)

Soursob is another introduction from South Africa and has become established in a number of districts, especially in the Avon Valley. Although the leaves have the appearance of a clover, Soursob is unpalatable and is not closely related to the clovers.

WEEDS of Western Australia

By **G.R.W. MEADLY** M. Sc.
Officer in Charge, Weeds and Seeds Branch

SOURSOB

(Oxalis pes-caprae L.)

DURING winter and spring, the yellow colouration of paddocks is not always due to the flowers of the widely distributed Capeweed. In some districts, particularly in the Avon Valley, the yellow-flowered soursob (Oxalis pes-caprae L.), has become firmly established. The genus Oxalis contains 800 or more different species, the two main natural centres of distribution being South Africa and tropical and extra-tropical South America.

The two species native to Australia have been supplemented by a number from South Africa. The commonest of these is *O. pes-caprae,* to which the name "soursob" is most frequently applied. The other species include yellow, pink and red-flowered types, having a similar herbaceous perennial habit.

Soursob has its strongest development in South Australia where, in many parts, it dominates the landscape. It occurs extensively in Victoria, and also infests appreciable tracts of land in New South Wales and this State. Species of *Oxalis* were introduced to England as garden subjects as early as 1658, while about a century later other species were arriving from the Cape of Good Hope. There is little doubt that the common soursob found its way to this country as an intentionally-introduced garden bulb, and almost certainly was brought from the Cape Province. It appears to have been introduced prior to the establishment of the Adelaide Botanical Gardens in 1855 and was recorded in the first catalogue of cultivated plants issued in 1859.

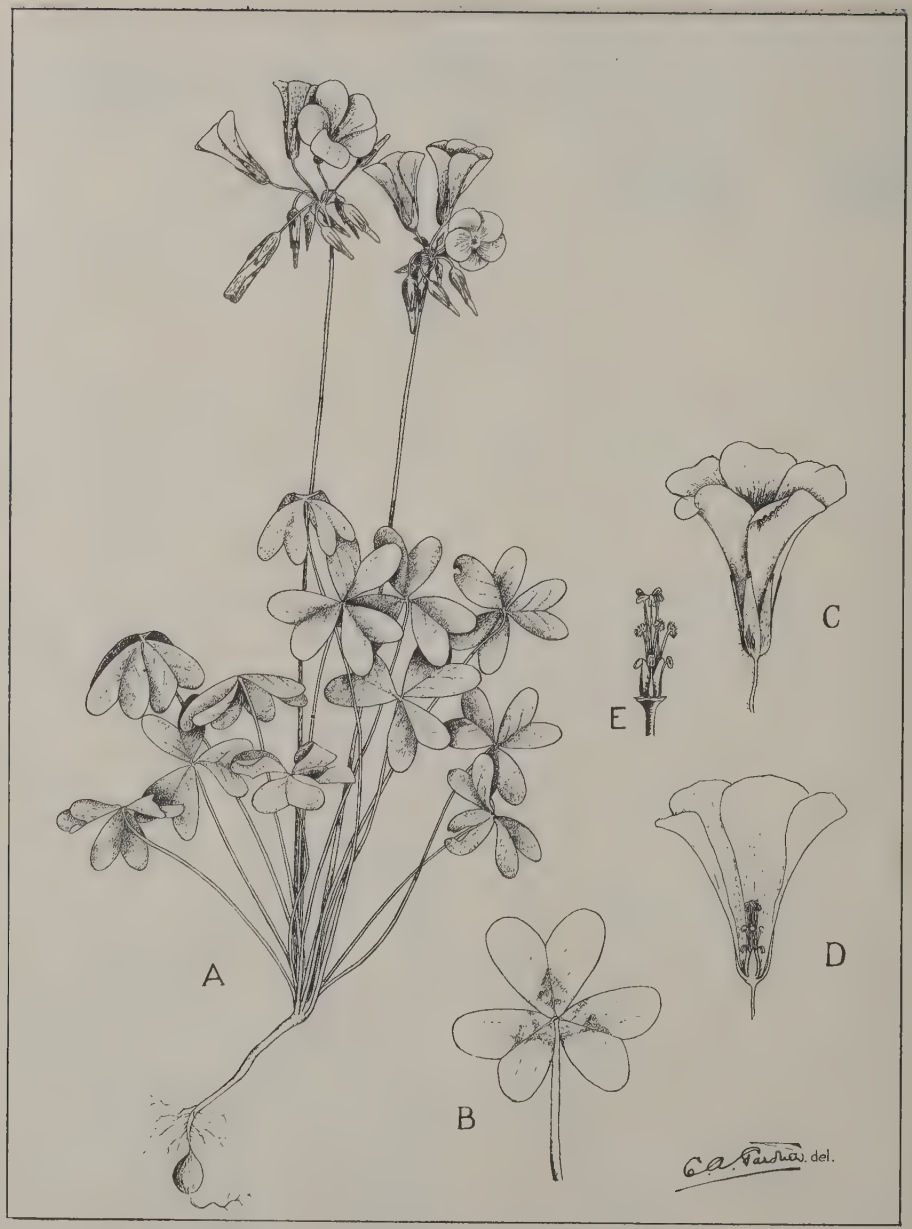
The date and method of introduction to Western Australia are uncertain but it is now widespread throughout the South-West and also occurs in the Avon Valley and parts of the Great Southern district.

DESCRIPTION.

The name "soursob" is a variation of "soursobs" more frequently used when it first appeared in Australia and undoubtedly is derived from the sour taste of the leaves. Until recently *O. pes-caprae* was known as *O. cernua. Oxalis* is the Greco-Latin name for some plants with bitter leaves. *Cernua* describes the drooping flowers while *pes-caprae* means the foot of a goat and alludes to the shape of the leaflets.

It is an almost glabrous perennial with a vertical subterranean rhizome up to $\frac{1}{2}$in. thick at ground level, but tapering into a fine thread attached to the parent bulb or root. The rhizome has numerous adventitious roots and also produces one to several bulbils in the axils of small scale-leaves. A cluster of typical leaves is formed at ground level. Each has a short flattened base, a long cylindrical stalk and three terminal, clover-like leaflets, often marked with small purple spots. The flowers are yellow, drooping and clustered in umbels of 3-16 on long peduncles. The capsule is pointed-oblong but rarely matures in Australia. Flowering usually occurs from June to October.

Although the leaves could be confused with those of clovers the flowers are very different and the plants are not closely related.



SOURSOB *(Oxalis pes-caprae* L.)

A—Complete plant showing bulb; B—Leaf; C—Flower; D—Section of flower; E—Stamens.
(From a pen-drawing by the Government Botanist, Mr. C. A. Gardner.)

SIGNIFICANCE.

In this State, soursob occurs in many orchards and is also a troublesome weed of crop land and pastures, especially in moist situations. Despite the delicacy of its structure the plant provides keen competition for other herbage, aided by the fact that development from bulbs and corms is usually more rapid than from seed. The prolific bulb formation gives rise to a dense mass of plants which tend to smother the less vigorous pasture species and can also affect the yield of cereal crops.

Owing to a high oxalic acid content—the cause of the sour taste—soursob is not eaten readily by stock. On occasions, however, because of the absence of more palatable herbage, sheep have eaten this weed in quantity and cases of chronic oxalic acid poisoning have occurred. Wethers have remained healthy when trouble has been experienced with ewes, apparently associated with the greater calcium requirement of ewes, especially when pregnant. All classes of sheep, however, can be affected.

The poisoning is considered to be due to the absorption of the oxalic acid into the animal's system to form calcium oxalate making the body deficient in available calcium. The disease usually does not appear until the animals have been grazing on the soursob for some time. Sheep reared in districts in which the plant is prevalent are less likely to be affected than animals introduced from an area where the weed does not occur.

In some cases the animals have died suddenly, in others they have lingered for some time. A stiffness in gait is followed by loss of control of the hind quarters and at times, also the forequarters.

CONTROL.

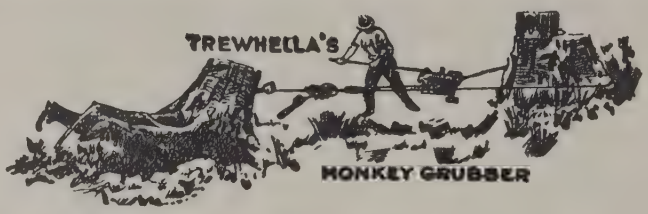
As already mentioned, grazing cannot be regarded as providing an effective method of control. As the plant is propagated mainly by means of bulbs which are in the process of forming before the flowering stage is reached, control measures must be commenced early in the season, usually in June or July. Ploughing and cultivation are not really effective if delayed until late winter or spring, as bulb formation is then nearing completion.

In South Australia, where the weed occurs freely on wheat land, satisfactory crops have been obtained by sowing early with a vigorous variety of wheat or by late sowing of an early maturing variety after necessary cultivations have been carried out. In the first case the objective is for the cereal to out-grow the weed, while in the second case the density of the weed is reduced, thus providing less competition for the cereal.

Soursob can be destroyed by the application of a 5 per cent. solution of sodium chlorate, but, owing to the cost, this method is only practicable for limited areas. The hormone-like herbicides alone are not effective but some encouraging results have been recorded by Orchard* following trials in South Australia with sodium chlorate added to 2, 4-D amine. Twelve ounces acid equivalent of the amine with one pound of sodium chlorate in 10½ gallons of solution per acre controlled the growth of soursob with little effect on the associated barley crop. Further work along these lines is being undertaken. As with cultivation, spraying must be carried out early in the season before bulb and bulbil formation has commenced.

Owing to the presence of dormant bulbs which may remain in the soil in a live condition for several seasons it is necessary to continue any control programme for at least three years.

*H. E. Orchard—Weeds of South Australia. Series 3. Bulletin No. 434.



GRUBBING

TREES AND STUMPS

and doing speedily what is otherwise slow and laborious work

Tremendous power exerted by

The Monkey Grubber

tears them quickly and cleanly from the earth with roots intact. A thorough and workmanlike job, and the unrivalled method of dealing with your timbered land.

A GRUBBING MACHINE equipped with cable of correct length, size and weight for ease of handling and embodying such features as multiple speeds, automatic releasing gear, rope shortener, snatch block, and simple sturdy rope couplings.

Each one a time saver and a labour saver, and to which the effectiveness gained by portability and ease of operation must be added.

With the MONKEY GRUBBER a day's work can be done in an hour.

It will surely be to your advantage to know about it from

THE JACK PEOPLE

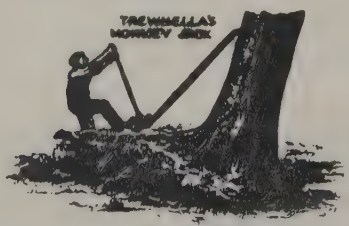
TREWHELLA BROS. Pty. Ltd.

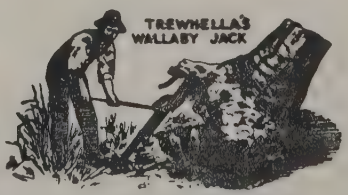
TRENTHAM, VIC.

W.A. Stockists: HARRIS SCARFE & SANDOVERS LTD.

McLEAN BROS. & RIGG LTD. CO-OPERATIVE WHOLESALE SERVICES LTD.

J. & W. BATEMAN LTD. THE BAIRDS CO. LTD. McPHERSON'S LTD.





BRUCELLOSIS (Contagious Abortion, Bang's Disease) OF CATTLE

By C. R. TOOP, B.V.Sc., Chief Veterinary Surgeon

BRUCELLOSIS, or contagious abortion as it is commonly called, seems to have been introduced into Western Australia with the early importation of cattle from the Eastern States and during the period of rapid expansion which took place in the dairying industry between the two World Wars it exacted a heavy toll. Abortion storms which at times caused the loss of more than half of the calf drop were common, and infertility was rife. More important was the heavy loss of production arising from the failure of aborting cows to return to full lactation and the long interval that often elapsed before they were again safely in calf.

During recent years the disease has been controlled by inoculation with Strain 19 vaccine which has been widely used throughout the dairying districts and has proved very effective as an immunising agent.

CAUSE OF THE DISEASE.

The disease is caused by the microbe *Brucella abortus,* and the consumption of food material contaminated by the discharges of affected cows provides the principal mode of infection. In the non-pregnant female, the organisms remain localised in the lymph glands but when pregnancy has become established, they invade the developing foetus and the membranes which envelop it, where conditions are especially favourable to their growth. Here they multiply and set up an inflammatory condition which involves both the uterus and foetal membranes and is followed by the death and expulsion of the foetus. This inflammatory process is particularly marked at the cotyledons or button-like masses of tissue which attach the foetal membranes to the uterus and through which the foetus receives from the maternal blood supply the nutrients necessary for its growth. Coincident with the infection of the uterus, the *Brucella* organisms may invade and become established in the udder where they remain localised for long periods and are excreted in the milk. The uterus usually becomes free of infection within a few weeks after abortion or calving whereas udder infections may persist for months or years. Cattle become susceptible upon reaching sexual maturity but calves are resistant to infection. When fed infected milk they harbour the organisms in the digestive tract and pass them out in the droppings but this infection is completely eliminated within a few weeks after the feeding of the milk has ceased.

SYMPTOMS.

Cows affected by Brucellosis do not suffer any disturbances to their general health. The act of abortion is the most common and often the only symptom and the discovery of an aborted calf usually provides the first evidence of the presence of the disease in the herd. Abortion may, however, be preceded by the usual signs of approaching parturition (normal calving) which include enlargement of the vulva and the presence of a mucous discharge, and in dry cows and heifers a well-marked increase in the size of the udder.

The majority of abortions occur between the fifth and seventh months of pregnancy but the foetus may be expelled at any time after the second or third month, or towards the end of the gestation period, when a live but weak and sickly calf which frequently dies, may be delivered. Following abortion a yellowish or chocolate-coloured discharge, which usually persists

Cattle being inoculated with Strain 19 vaccine at an inoculation centre near Donnybrook. Since this vaccine became available in Western Australia, during 1946, over 170,000 heifers have been immunised against Brucellosis by this means.

for several weeks, may issue from the vagina. With early abortions the foetal membranes (afterbirth) are usually expelled with the foetus but after the fifth month retention of the afterbirth is a frequent and troublesome complication. Temporary infertility or sterility resulting from inflammation of the uterus is a common sequel to infection and may become a serious problem in the herd. Enlargement of the joints (hygroma) and particularly the knee joints, one and sometimes both of which may become affected, is occasionally observed. These swellings are large, soft and non-painful and result from the invasion of the joint by the brucella organisms.

SYMPTOMS IN THE BULL.

In the bull, *Brucella* organisms may invade the testicles and associated glands where they cause inflammation and swelling. One or both testicles may show considerable enlargement. Bulls affected by lesions of the testicles are frequently sterile.

MODE OF INFECTION.

In the vast majority of cases infection occurs by the mouth as the result of the consumption of pasture or fodder contaminated by *Brucella* organisms. At the time of abortion, the foetus, foetal membranes and fluids which are voided from the uterus contain enormous numbers of these organisms which escape to the exterior and contaminate the pastures. The discharges voided after normal calving by infected cows which do not abort are similarly infective. The consumption of food material contaminated in this manner provides the principal means by which the disease is spread. Cows may also become infected by licking themselves or other cattle soiled by these discharges.

Experimentally the disease may be transmitted without difficulty by instilling a few drops of a culture of *Brucella abortus* into the eye of a susceptible animal. This suggests that infection might be spread through the agency of flies but the available information does not suggest that transmission by this means is a factor of any practical importance. It has also been shown that infection may occur through the unbroken skin so that the possibility of cows becoming infected by lying on ground contaminated by the discharges of an aborting cow or from splashing with urine containing infective material, cannot be ignored.

THE ROLE OF THE BULL.

It was at one time believed that the bull played an important part in the transmission of the disease but this view has since been proved erroneous. While infected bulls may pass out *Brucella* organisms in their semen it has not been found possible to transmit the disease experimentally by mating infected bulls with healthy cows. All of the available evidence indicates that the part played by the bull in the spread of brucellosis is of minor importance.

THE INTRODUCTION OF INFECTION.

The introduction of the disease into a herd is almost invariably associated with the purchase of infected cows or heifers which spread it to other cattle after calving or abortion. Similarly the disease may be introduced after cattle have been allowed to graze on public roads or common pastures frequented by other cattle, or when they have been transferred to another property for service or agistment. Other factors which may play a part in the introduction of infection include the transfer of an aborted foetus or portion of the afterbirth to a "clean" property by dogs, foxes or birds, or the infection of "clean" pastures by drainage or flood waters from neighbouring properties. The transmission of infection on the footwear or clothing after a visit to an infected herd is a further possibility. While none of these factors may be excluded they are probably of little importance in actual practice.

INFECTED HORSES.

The horse is susceptible to infection with *Brucella abortus*. Horses running with infected cattle sometimes give a positive reaction to the agglutination test and may pass out the organisms in their droppings. The organisms may also be found in the abscesses which form in horses affected by fistulous withers and poll evil. These conditions will be recognised as large painful swellings which develop in the region of the withers and poll and finally rupture

and discharge pus for a prolonged period. Although horses play only a minor part in the spread of the disease to cattle the precaution should be taken of isolating or disposing of horses suffering from these conditions.

SURVIVAL OF INFECTION ON THE PASTURES.

The length of time during which the infection is able to survive on contaminated pastures depends largely upon seasonal conditions. The organisms are destroyed within the space of a few hours when exposed to direct sunlight but may survive for a considerably longer period in well shaded areas.

Observations made at Glenfield, New South Wales, have shown that the organisms will live for less than a month during spring or summer, but may survive for as long as 100 days during winter. This would suggest that in order to free a pasture from infection it would be necessary to leave it unstocked for a month in summer and for at least three months in winter.

INCUBATION PERIOD.

The incubation period of the disease i.e., the period which elapses from the time of exposure to infection to the time of abortion or the first occurrence of a positive reaction to the agglutination test is usually about three months, but it may vary from six weeks to as long as six months. In some cases a positive agglutination reaction does not develop until after abortion has occurred. A consideration of the length of the incubation period is important when measures for the prevention and control of the disease are being applied.

COURSE OF THE DISEASE.

Upon gaining entrance to a "clean" herd the disease frequently runs an acute course causing a large number of abortions or premature births extending over a period of one to two years. During this period a number of abortions may occur in rapid succession giving rise to the so-called "abortion storm." After the storm has subsided the disease passes on to a chronic stage. As the result of exposure to infection the herd is now largely composed of animals which have developed an immunity or resistance to the disease which enables them to carry their calves to full term. Cows which have aborted on one occasion do not usually abort a second time but two or more abortions may occur in a small percentage of cases. Furthermore, many infected cows do not abort at all and this is more likely to be the case if they have been exposed to infection when non-pregnant. Such resistant animals however may still harbour the infection which they are capable of spreading to other animals following normal calving. In these resistant herds, sporadic abortions may continue to occur but they are largely confined to heifers and newly-introduced cows. As a sequel to the acute phase of the disease, retention of the afterbirth and infertility may become a serious problem in the herd.

RETENTION OF THE AFTERBIRTH.

Retention of the afterbirth is frequently observed in herds affected by Brucellosis. In consequence of the inflammatory condition caused by the organisms, adhesions may occur between the uterus and foetal membranes (afterbirth) which may be retained for many days during which time putrefactive changes take place. Gross infection of the uterus occurs and this may later be followed by infertility which is a frequent sequel to this condition. The general health of the animal is usually unaffected but sometimes as the result of absorption of toxic products from the uterus there are symptoms of sickness including loss of appetite and condition and reduction of milk yield, while in some severe cases death may occur from septic inflammation of the uterus and blood poisoning. Normally the afterbirth is shed within a few hours of the delivery of the calf, but this may be delayed for as long as twenty-four hours and need cause no concern. When, however, the afterbirth is retained for more than two to three days, treatment becomes necessary.

Provided the cow shows no evidence of sickness, the membranes may be safely left until they become detached by sloughing at the cotyledons and they may then be completely removed by gentle traction with a hand inserted into the vagina. This is usually possible after an interval of

seven to ten days and in the meantime the uterus should be irrigated daily with an antiseptic solution (a tablespoonful of salt to a gallon of water or a 1 per cent solution of Dettol) introduced by means of a large funnel and a length of ½in rubber tubing. Antiseptic capsules may be inserted into the uterus as an alternative to irrigation.

When circumstances render manual removal necessary, the hand should be introduced deeply into the uterus and the membranes gently detached, by manipulation with the fingers, from the cotyledons or button-shaped areas at which they are adherent, but under no circumstances should they be forcibly torn from these attachments. Several attempts repeated at daily intervals may be necessary before the membranes can finally be removed and the uterus should be irrigated in the manner described above until this result has been obtained. Antiseptic precautions should always be observed and should include thorough washing of the hands and arms of the operator and the external parts of the cow with an antiseptic solution.

Retention of the afterbirth must be regarded as a serious problem and veterinary assistance should be obtained whenever it is available.

INFERTILITY.

In herds affected by Brucellosis, infertility or failure to hold to service is a frequent complication. *Brucella* organisms which are present in the uterus, set up a chronic inflammatory condition known as metritis which may persist for a considerable period after abortion or normal calving has occurred. This inflammation is accompanied by the formation of discharges which destroy the sperms of the male so preventing the fertilisation of the ovum or egg of the female. These discharges do not usually persist for more than three or four weeks, but a period of several months may elapse before the uterus returns to its normal healthy condition. It is therefore advisable to withold cows from service for at least three months after abortion has occurred.

In addition, other bacteria may gain a foothold in the already affected uterus, increasing the severity and duration of the inflammatory process and producing a more obstinate type of infertility which in some cases may be permanent. This is particularly likely to occur when the afterbirth has been retained.

Infertility resulting from inflammation of the uterus is however not necessarily associated with Brucellosis and may occur in herds that are free of this disease. It is, however, much more prevalent in herds in which *Brucella* infection exists. Infertility of this type usually responds very satisfactorily to treatment which involves the irrigation of the uterus with a weak antiseptic solution, after a catheter (irrigation tube) has been passed through the cervix or neck of that organ. Treatment of this kind however is beyond the capacity of most laymen and requires the services of a veterinary surgeon.

While Brucellosis is a common cause of infertility, this condition may result from a variety of other causes including other infections such as vibriosis, abnormalities of other portions of the genital tract, infertility of the bull and nutritional deficiencies. Before any treatment is undertaken, a correct diagnosis is necessary and veterinary assistance should be sought whenever this condition becomes a problem in the herd.

DIAGNOSIS.

Brucellosis is responsible for the majority of the abortions which occur among dairy cattle. Consequently, when one or more abortions occur on a property, the presence of the disease should be suspected and precautions should be taken against the further spread of infection. Abortions may result from other causes including accidents and injuries, nutritional deficiencies (Vitamin A) and the presence of other infections (vibriosis, leptospirosis) but Brucellosis should not be excluded until definite proof has been obtained. The disease may be diagnosed with a high degree of accuracy by the application of the agglutination test. Blood samples may be forwarded to this Department for testing when the diagnosis is in doubt.

THE AGGLUTINATION TEST.

For the application of the agglutination test, a small sample of blood is required which is collected into a sterile half-ounce

bottle either from the jugular vein or a small incision of the ear or tail. After collection, the sample is labelled for identification and allowed to stand until clotting occurs. The clear straw-coloured fluid which separates from the clot on standing is the serum which is used for testing purposes.

In carrying out the test, small measured amounts of serum are added to measured amounts of a milky suspension of *Brucella* organisms contained in test tubes and the result is read after the mixture has been allowed to stand in an incubator for 24 hours. The serum of an animal affected by Brucellosis contains specific antibodies known as agglutinins which are produced within the body of the animal to assist it to resist the infection. When the serum under test contains these agglutinins, the organisms become clumped together or agglutinated and fall to the bottom of the test tube forming a white deposit which is accompanied by clearing of the overlying fluid. This constitutes a positive reaction. In the case of a negative reaction there are no agglutinins present in the serum, clumping of the organisms does not occur, and the suspension retains its milky appearance.

The application of the agglutination test to a dairy herd will reveal the extent of infection. It may frequently be observed that a proportion of the animals giving a positive reaction to the test have no history of abortion and that others although exposed to the disease have been able to resist infection.

PREVENTION AND CONTROL.

When a herd is free of Brucellosis every endeavour should be made to maintain it in that condition. Since the disease is usually introduced by the purchase of infected cows or heifers, the most favourable prospects for success will be provided by the maintenance of self-contained herds which are able to breed their own requirements and are not reliant on an outside source for replacements. In such herds new purchases should be confined to young bulls but, should the introduction of females become necessary, purchases should be made subject to a negative agglutination test. Owing to the long incubation period of the disease even this procedure is not without risk. Complete reliance cannot be placed upon a single test and a greater margin of safety is provided by two tests separated by an interval of 60 to 90 days, the animals in the meantime being held in isolation.

CONTROL BY THE APPLICATION OF HYGIENIC MEASURES.

It has previously been pointed out that the infection is spread by the contamination of the pastures by the aborted foetus and its membranes, as well as by the discharges voided by infected animals following abortion of calving. Consequently it should be possible to control the disease by separating such animals from the herd prior to abortion or calving and holding them in isolation until all discharges have ceased. To effectively apply this method of control, maternity or calving stalls must be provided, and pregnant cows and heifers must be kept under daily observation. When there is evidence of impending abortion or approaching calving, the animal is removed immediately to the maternity stall where it is segregated until discharges have ceased and the aborted foetus and afterbirth are disposed of by burning or burial with quicklime. The cow is irrigated daily with a weak antiseptic or a solution of salt in water in the strength of a tablespoonful to the gallon so long as the discharge persists. Precautions are taken to prevent the transfer of infection on the clothing and footwear of attendants to other members of the herd. The maternity stall is thoroughly disinfected after the animal has been removed.

Although this method of control has proved effective in other countries it is rarely practicable under Australian conditions. It should, however, be possible on most dairy farms to provide a small isolation paddock where cows which have aborted or are showing signs of approaching abortion can be segregated and subjected to daily irrigation until there is no further evidence of discharge.

Where there is evidence that an abortion has occurred a search should be made for foetus and afterbirth which should be burned or buried deeply, the surrounding area being liberally coated with quicklime. While these incomplete measures cannot

be regarded as an effective means of control, they should do much towards checking the spread of the infection and may prevent the development of an abortion storm.

THE TEST AND SLAUGHTER METHOD.

This is based upon the agglutination test and aims at the complete eradication of the disease from infected herds. All cattle above the age of six months are included in the test and those which give a positive reaction are removed for immediate slaughter. Testing is repeated at intervals of 30 days when any additional reactors are similarly removed. When two consecutive completely negative tests have been obtained the herd is declared abortion-free and thereafter is subjected to an annual retest. After the disease has been eradicated, new introductions are confined to cattle from other abortion-free herds and to cattle which have passed two agglutination tests separated by an interval of 60 days. Eradication should never be attempted during the acute stage of the disease while frequent abortions are occurring, when, in consequence of the heavy contamination of the premises, it presents a most difficult problem. The difficulty of eradication is however greatly reduced after the disease has progressed to the chronic or resistant stage.

The test and slaughter method has been widely applied in the United States where a nation-wide campaign for the complete eradication of brucellosis is now in progress. This scheme was introduced in 1934 as a drought relief measure for the disposal of surplus cattle and has since made remarkable progress. Compensation is paid to the owners of reacting cattle.

While the advantages to be derived from the eradication of the disease are obvious, being reflected in an increase in the number of calves produced, greater breeding efficiency and increased milk production, it is a very costly procedure and there are few other countries in which it could be adopted as a general method of control. In Western Australia where the infection is widely distributed throughout the dairying areas and its incidence may be high in many herds, there is little scope for control by the test and slaughter method and except in herds where the initial incidence of infection is low and which are so isolated that the re-introduction of the disease is remote, it may be regarded as neither practicable nor economically possible. Furthermore, the abortion-free herd is composed of highly susceptible cattle which are extremely vulnerable to infection. Should this occur, an abortion storm accompanied by heavy loss would be likely.

IMMUNISATION WITH STRAIN 19 VACCINE.

Prior to the advent of Strain 19 vaccine there was no effective method of control which was capable of practical application under local conditions. This product is a live vaccine prepared from strains of *Brucella abortus* of low virulence and while it is unable to produce abortion when injected into susceptible cattle it stimulates the formation of antibodies in their blood and tissues which enables them to resist the disease if subsequently exposed to fully-virulent field strains. Although this immunity is not absolute and may be broken down by exposure to massive infections it is of a high order and appears to endure for the life of the animal.

Strain 19 Vaccine became available to the veterinary profession in Western Australia in 1946 and since that time about two-thirds of the heifers bred in the dairying districts have been immunised as yearlings annually. This has reduced the abortion rate to a low level and the disease is no longer regarded as a serious problem. The vaccine has also proved effective in dissipating impending abortion storms in dairy herds in which several abortions have already occurred, and in our experience adult cattle may be safely inoculated regardless of the duration of pregnancy. Further information on Strain 19 vaccine and the vaccination service provided by the Department is contained in Leaflets 875 and 1095, copies of which will be supplied on application.

DANGER TO THE HUMAN HEALTH.

Undulant fever in man may be caused by the same organism which causes Brucellosis in cattle. The disease in man

may be contracted by the consumption of milk from cows harbouring the infection in their udders, or by contact with infected cattle at the time of abortion or calving. Infections of the latter type are occupational, occurring most frequently amongst veterinarians and dairy farmers who may be required to assist at a difficult calving or in the removal of a retained afterbirth. Cases occurring in cities are almost invariably associated with the consumption of infected milk. Although a very small proportion of persons who are exposed to infection actually develop symptoms of undulant fever, the severity of the condition may be such that precautions should be taken for its prevention. Strict antiseptic precautions should always be taken during the handling and treatment of infected animals. Boiling or efficient pasteurisation will render milk safe for human consumption.

FREE SERVICE TO FARMERS

Do you know that the Department of Agriculture provides a comprehensive service of advice and technical assistance to farmers, free of charge?

When in need of advice, get in touch with your District Officer whose name and headquarters township will be found in the list of Departmental personnel on Pages 386 and 387.

These officers are there to help you and will make personal visits to your property to assist with on-the-spot advice. In addition, they will, where necessary, arrange for the services of specialist officers—all without cost to you.

FRUITGROWERS

Be prepared for your coming 'spraying' programme

Use

C.S.M.L.

LIME SULPHUR SPRAY

AVAILABLE IN

44 gallon and 5 gallon Drums

MANUFACTURED BY

Cuming Smith & Mount Lyell Farmers Fertilisers Limited,
133 St. Georges Terrace, Perth

ORDERS CAN BE PLACED THROUGH ANY OF OUR DISTRIBUTORS

Fig. 1.—Emus drinking on Woodstock Station in the Port Hedland area.
(Photo by C. D. Gooding.)

THE VERMIN BONUS SYSTEM IN WESTERN AUSTRALIA

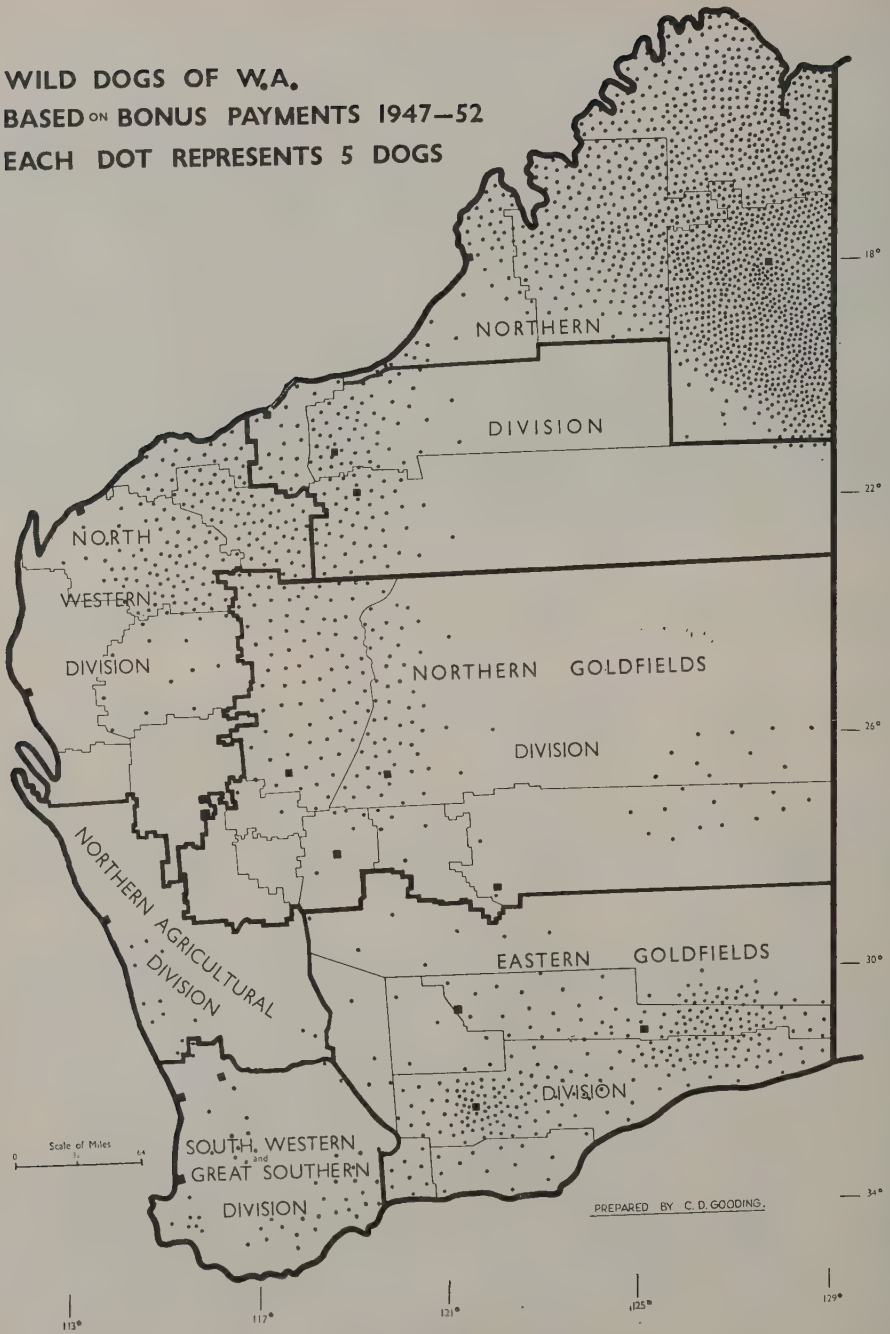
PART 1 – THE DISTRIBUTION OF PAYMENTS

By C. D. GOODING, B.Sc., (Agric.), Vermin Control Research Officer.

RABBITS, dingoes or wild dogs, foxes, emus, kangaroos (in certain areas) and wedge-tailed eagles are the most economically important vermin species in Western Australia. They are responsible for heavy losses to the agricultural and pastoral industries and—except in the case of rabbits and kangaroos—vermin bonuses are paid for their destruction.

Other animals, birds and insects gazetted as vermin in certain districts or throughout the State are:—Argentine ants, *blackbirds*, boody rats, bulbuls, black cockatoos, little corellas, cats, camels, *Ceylon crows*, donkeys, white-bellied sea eagles, certain finch species, galahs, goats, grasshoppers, *giant toads, hares, Indian mynahs*, certain parrot species (including "twenty-eights," West Australian rosellas, smokers and West Australian king parrots), pigs, pigeons, *Californian quails, sparrows, starlings* and *English thrushes*. Those printed in italics are not established in Western Australia. Boody rats were declared vermin in the Denmark district in 1922 and no attempt has been made to remove them from the list. However, they have now become so rare that every effort is made to prevent the species from becoming extinct. Normally, the legislation is designed to prevent the introduction of undesirable species and to control the pests that are already established.

The early separation of Australia from other land masses resulted in this country possessing fauna which could, in many cases, be described as "living fossils." Most of our truly indigenous species are either of marsupial or lower forms—with the exception of rodents and bats. Their primitive nature has placed them in an


WILD DOGS OF W.A.
BASED ON BONUS PAYMENTS 1947—52
EACH DOT REPRESENTS 5 DOGS
NORTHERN
DIVISION
NORTH
WESTERN
DIVISION
NORTHERN GOLDFIELDS
DIVISION
NORTHERN AGRICULTURAL
DIVISION
EASTERN GOLDFIELDS
DIVISION
SOUTH WESTERN
and
GREAT SOUTHERN
DIVISION
Scale of Miles
PREPARED BY C. D. GOODING.
18°
22°
26°
30°
34°
113°
117°
121°
125°
129°

unfavourable position from the point of view of competing with the higher forms of animal life which have been introduced, and our most serious vermin pests are the introduced species.

The competition which the introduced animals encountered in colonising this new land was not great. For instance, indigenous fauna, such as small marsupials and ground-nesting birds, have been reduced in numbers within living memory by the depredations of foxes. It should be remembered however that man's activities in clearing and tilling land—thus reducing the area of the natural habitats—has in many cases done the work popularly accredited to the fox.

The dingo is in another category. He was probably introduced from the northern land masses, and the most feasible explanation of his presence is that the introduction occurred by some sea route about 6,000 years ago.

During the time that elapsed between then and the advent of white men in Australia, the dingo had sufficient time to reach some sort of equilibrium with the animals that existed at the time of his entry. The dingo is often considered a lesser evil than the fox in the destruction of indigenous fauna—but we do not know what types existed when the dingo arrived in the country and it is at least possible that some were completely killed out before white men reached Australia.

The rabbit invasion of Australia is legendary. From the few that were liberated in the Eastern States to provide food, and to satisfy the sporting instincts of the early colonists, have sprung the countless legions that today plague millions of fertile acres. There was no natural enemy in the Australian fauna that could hold the rabbits in check. The dingoes killed many but their efforts exercised but little control on the spread of the worst of all our pests.

In an effort to control the rabbits—and again to provide sport—foxes were introduced into Victoria about 1868. Like other introductions, they found a favourable environment with practically no competition from other animals and so rapidly extended their territory.

Foxes appear to favour the rabbit-infested areas but are by no means dependent upon the presence of rabbits for their spread. In this State, one of our most serious fox infestations occurs in the Roebourne coastal country where rabbits are not prevalent.

Fig. 2.—The dingo. His slinking, sidling gait carries him over many miles of country in search of prey.
(Photo by C. D. Gooding.)

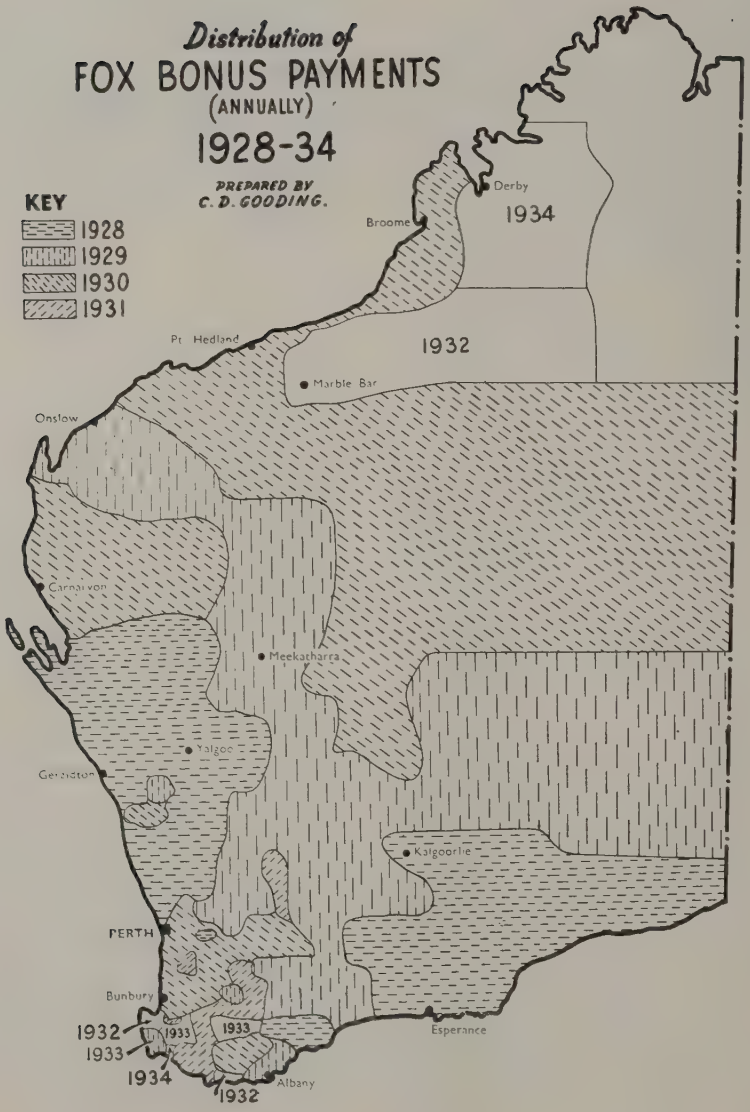
In the development of pastoral areas in the outback, man has provided better facilities for the feeding and breeding of vermin, notably kangaroos. In its unimproved state, much of our pastoral land was waterless for most of the year. Kangaroos would move in when surface water was available but could not remain there for any length of time in normal seasons.

By sinking bores and bringing underground water to the surface, man has provided permanent drinking facilities in many formerly arid regions and greatly increased the area over which the pests can range and multiply.

With no enforced "spelling" of the vegetation due to lack of water supplies, many valuable edible plants and grasses have been "eaten out" by kangaroos—aided of course by the sheep flocks—and the kangaroo has developed into a serious threat to the pastoral industry. Extensive water-boring programmes during the post-war years have resulted in tremendous increases in the vermin populations, and kangaroos are now one of the major factors limiting the productivity of the outer areas.

VERMIN POPULATIONS.

Although numerous articles dealing with the control of vermin have appeared in this Journal over the years little has been


Distribution of
FOX BONUS PAYMENTS
(ANNUALLY)
1928-34
PREPARED BY
C. D. GOODING.
KEY
1928
1929
1930
1931
Derby
1934
Broome
1932
Pt Hedland
Marble Bar
Onslow
Carnarvon
Meekatharra
Yalgoo
Geraldton
Kalgoorlie
PERTH
Bunbury
1932
1933
1933
1933
1934
1932
Albany
Esperance

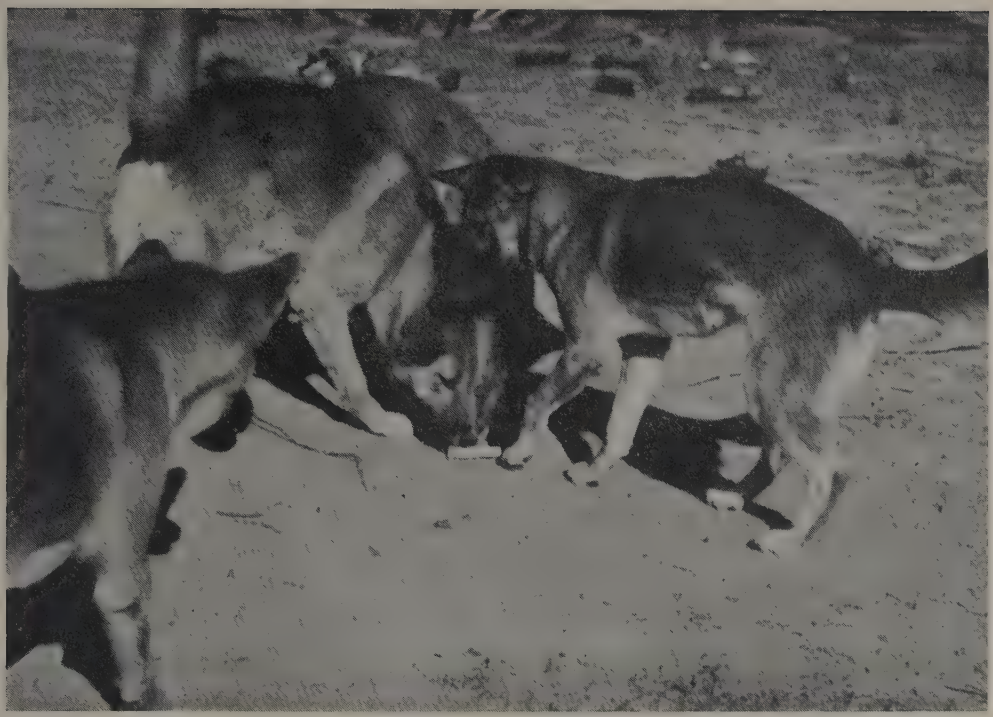


Fig. 3.—The pack instinct comes to the fore as these dingoes tussle for scraps of food.
(Photo by C. D. Gooding.)

done to indicate the areas in which the animals are most numerous, or the areas in which they cause greatest concern to agricultural and pastoral interests.

The series of maps accompanying this article may provide some indication along these lines, but it must be remembered that they are compiled from past bonus payment figures and as such have their limitations.

While they show where most bonuses have been paid, they do not necessarily show where the heaviest densities of pest populations occur. Naturally, in some cases there will be a marked correlation between these two factors, but it does not necessarily follow that the heaviest bonus payments were made in the areas where the pests were most plentiful.

Many factors can influence the number of scalps presented for bonus payments at Vermin Board offices throughout the year, and the outstanding ones are listed as follows:—

(1) Density of pest population in the area.

(2) Destructiveness of the particular pest.

(3) Type of farming practised.

(4) Degree of settlement density.

(5) Ease or otherwise of control.

(6) Percentage of carcass recoveries.

(7) General level of prosperity of the farming community.

(8) Conflicting ideals (e.g. fauna conservation).

(9) Level of bonus payments.

(10) Interest of a Vermin Board in handling scalps.

All these factors have influenced the bonus payments from which these maps were compiled, and in the case of the foxes, another factor has operated, in that they are comparatively recent arrivals in this State.

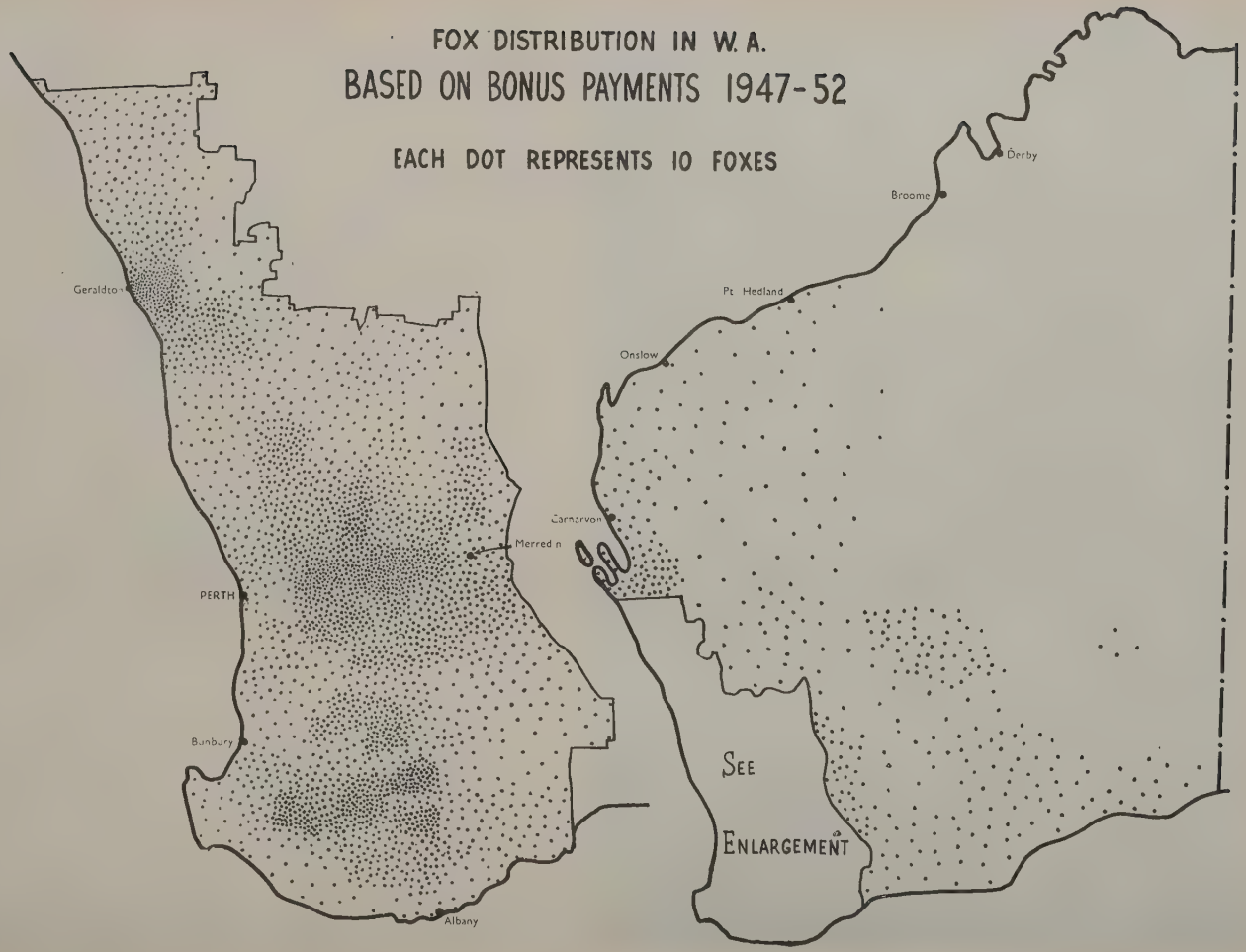

FOX DISTRIBUTION IN W. A.
BASED ON BONUS PAYMENTS 1947-52
EACH DOT REPRESENTS 10 FOXES
Derby
Broome
Pt Hedland
Onslow
Geraldton
Carnarvon
Merredin
PERTH
Bunbury
Albany
SEE
ENLARGEMENT

Fig. 4—A wedge-tailed eagle's nest in the Lake Frome district, South Australia.
(Photo by F.N.R.)

THE DINGO.
(Canis familiaris dingo).

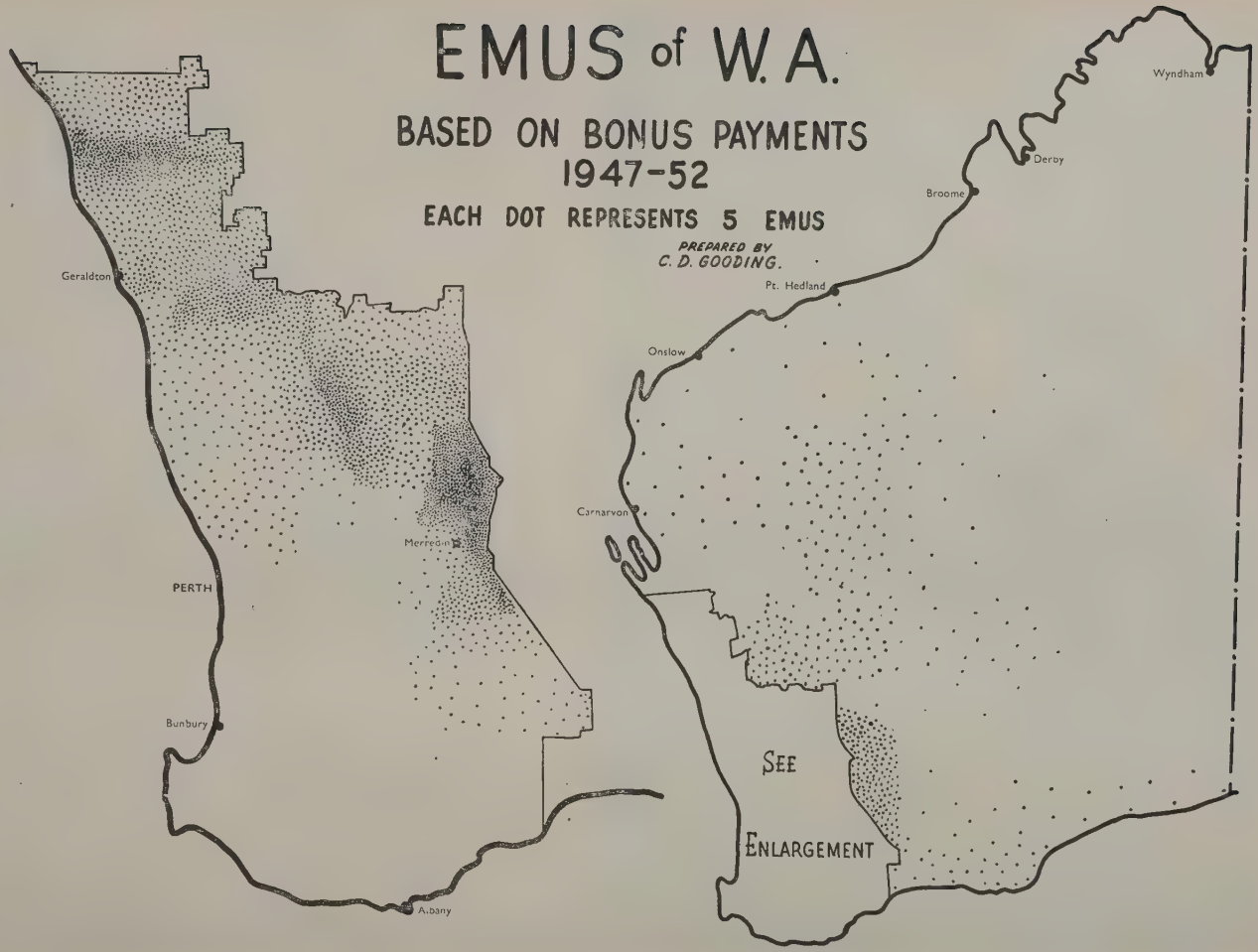
For information on dingo distribution see article "Wild Dogs and Dingoes in Western Australia" by A. R. Tomlinson in Vol. 4 No. 1 (January-February, 1955) of this Journal. It was reprinted as Bulletin No. 2,223. The map which accompanied the article is reproduced here for purposes of comparison.

THE FOX.
(Vulpes vulpes).

Foxes were first observed in Western Australia in 1916 and the extent of their spread by 1928 is indicated by the accompanying map. After 1928 (the first bonus figures we have recorded) foxes spread rapidly into the pastoral areas until by the end of June, 1931, they were in every district with the exceptions of Marble Bar and the Kimberleys.

In the South-West portion of the State, the general spread was in a south-westerly direction—the only districts which had not paid fox scalp bonuses up to 1931 being Sussex, Bridgetown, Nannup, Kojonup, Broomehill, Tambellup and Denmark. Of these, all except Nannup paid on scalps by the end of 1933—Nannup finally paying on its first scalp in 1934. It is also interesting to note that the Augusta-Margaret River Vermin Board paid on a scalp in 1929 but made no further payments for four years.

The spread into the northern portions of the State was much more easy to plot. Nullagine, Roebourne-Tablelands and Broome paid for fox bonuses for the first time in 1931; Marble Bar in 1932; West Kimberley in 1934; and Hall's Creek and Wyndham not until 1943.


EMUS of W.A.
BASED ON BONUS PAYMENTS
1947-52
EACH DOT REPRESENTS 5 EMUS
PREPARED BY
C. D. GOODING.
Wyndham
Derby
Broome
Pt. Hedland
Onslow
Carnarvon
Geraldton
Merredin
PERTH
Bunbury
A.bany
SEE
ENLARGEMENT

It has often been said that the foxes followed the same path of invasion as the rabbits. Records of bonus payments suggest that they followed a line extending west-north-west from Eucla until they reached the western coastline in the vicinity of Geraldton.

The first recorded instance of the shooting of a fox in this State was in 1917 at Sandstone, but it is significant that the largest bonus payments in the first year were in Dundas, Kalgoorlie, Yalgoo, Dandaragan, Perenjori, Mingenew, Geraldton, Mullewa, Upper Chapman, Northampton and Shark's Bay.

Today we find foxes spread through almost the whole of the State, although they have not flourished in the Kimberleys as they have in the more southerly areas. Competition with wild dogs is possibly greater in the Kimberleys than elsewhere but this alone cannot be the reason for the shortage of foxes as the two species co-exist successfully in the Warburton Ranges.

It seems likely that the high humidity and tropical conditions experienced in the Kimberleys for four months of the year are mainly responsible for the low fox population. The largest number of fox scalps ever presented in the Kimberleys was 69 in 1946—a figure that hardly compares with the 1,115 paid for at Northampton as long ago as 1931, or the 2,509 presented at Kalgoorlie in 1934.

Bonus payments on fox scalps have varied from 40s. in 1928-31 to as low as 2s. 6d. from 1936-42 but the variations had little influence on the numbers of scalps presented which have risen constantly. The present rate of bonus payment is 4s. and this is supplemented in some cases by Vermin Boards. (This subject will be dealt with more fully in a later article).

THE EMU.

(Dromaius novae—hollandiae).

These birds are found in all parts of Western Australia from the South Coastal region to the northernmost areas. They constitute a menace to cereal crops in the outer agricultural areas (Northern, North-Eastern and Eastern) and it is from these three areas that the most beaks are presented for bonus payments each year.

Emus are protected in all districts west of the No. 2. Rabbitproof Fence and south of the Great Eastern railway line.

The uniform bonus was first paid on emus in 1945. Since then, the numbers of beaks paid for have fluctuated violently and varied from 5,395 to 30,174 in different years. Prior to 1945, when the uniform bonus was instituted, we have records of 56,097 and 15,156 bonuses being paid in of the No. 2 Rabbitproof Fence and south 1936 and 1937 respectively. These payments were made from a special grant provided to meet the emergency which then existed.

It would appear from the bonus figures and from observations made in the field, that the emus breed mainly in the pastoral areas such as the Murchison and North-Eastern Goldfields divisions. When conditions become harsh in these districts, large numbers of the birds move in towards the agricultural areas where they are responsible for considerable damage to crops and fences.

The old Rabbitproof Fences have, in past years, exercised some control over the birds and have partially prevented the invasion from reaching the closer-settled areas. Thus we find that the largest numbers of beak bonuses are paid in the Vermin Board areas of Northampton and Mullewa (No. 3 Fence); Dalawallinu (No. 2 Fence); Mt. Marshall, Mukinbudin, Westonia and Yilgarn (No. 1 Fence). Most of the shooting of the birds occurs to the north and east of these fences.

In so far as they form a temporary barrier against periodical influxes of emus, the Rabbitproof Fences play a worthwhile part in their control. They assist also in forming a zone of concentration in which control methods may be applied more effectively.

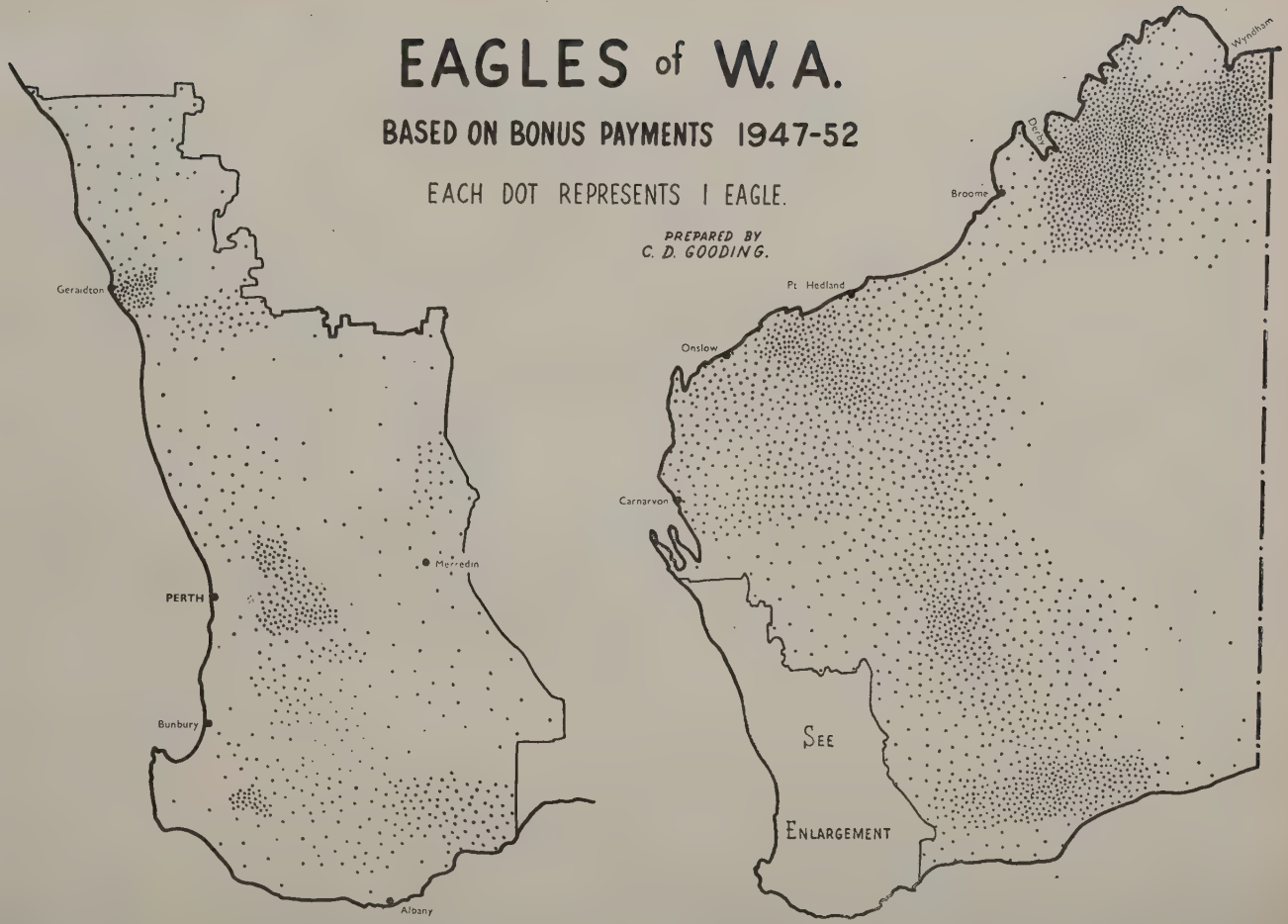
The proposed new Emu-proof Fence, which is being constructed at right-angles to the two existing fences (Nos. 1 and 2), will form a pocket in which the emus which breed between the two fences will tend to congregate. With this added barrier, the control of the pests should become less of a problem than it is today, since they will be more effectively excluded from large areas which they periodically invade at present.

EAGLES of W.A.

BASED ON BONUS PAYMENTS 1947-52

EACH DOT REPRESENTS 1 EAGLE.

PREPARED BY
C. D. GOODING.



THE WEDGE-TAILED EAGLE.

(Uroaëtus audax).

The numbers of eagle scalps presented for bonus payments have been gradually decreasing over the years and this may be an indication that they are not now considered the nuisance that they were in earlier years. It is noteworthy that the bonus payments in the pastoral areas vary little in numbers from those paid in the early years, whereas the marked decreases have taken place in the agricultural areas.

Eagles still abound in certain of the agricultural areas, the writer having seen six at one time on a property in the Beverley district only two years ago.

Comparing the maps for eagles and wild dogs it would appear that there is a marked similarity between the two distributions. Either the factors which favour the perpetuation of the wild dog must also favour the wedge-tailed eagle—or alternatively the eagles do the greatest damage to the livestock industry which is similarly prone to losses from wild dog depredations, and consequently greater efforts are made to keep down their numbers in these localities.

Recently a circular was sent out to all Vermin Boards in the State asking for their views on the continuance or discontinuance of the bonus system on wedge-tailed eagles.

The concensus of opinion in pastoral areas was overwhelmingly in favour of keeping the wedge-tailed eagle on the list of declared vermin and continuing the bonus. Opinions varied in the agricultural areas. In the lower South-West, where sheep are not the main livestock on the farms, some boards are of the opinion that the eagles should be protected. In the sheep-farming areas most of the boards were in favour of continuing the bonus, but on the whole there was a much more tolerant attitude towards eagles in the agricultural areas than there was in the pastoral zone.

Ester 2,4-D in highly concentrated form

for
- Radish and Turnip control where NO undersown clovers.
- Aerial spraying of cereal crops.
- When conditions for spraying are not ideal, e.g., dry and dusty.
- Ease of mixing with hard waters.
- Cape tulip control in pastures.

'AMOXONE' —50% Amine 2,4-D
- Reliable and safe for ground spraying against radish, turnip and mustard in hard water areas. Spreads and wets well.

'METHOXONE' 30
- The safest of all hormone weedkillers for Turnip control.
- Has least effect on clovers and cereals.
- Not recommended for use with hard water.

Spray Weeds when Young for Best Results

Order now from your Usual Supplier

W. Aust. Distributors:
Elder, Smith & Co., Ltd.,
113 St. George's Terrace,
Perth
and **Westralian Farmers Co-op. Ltd.,**
569 Wellington Street,
Perth

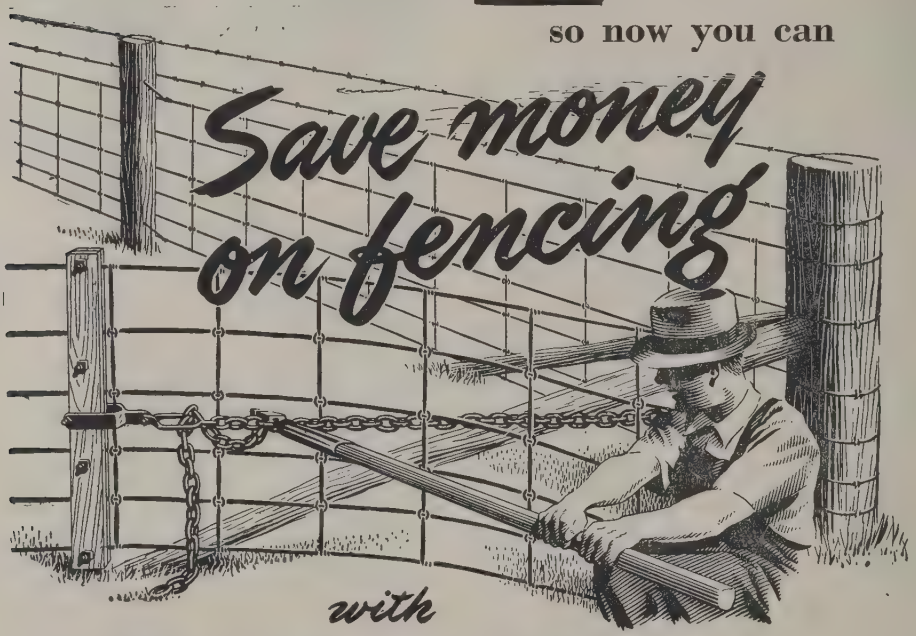
SAG.49W.1648

DEPENDABLE PLANT PROTECTION PRODUCTS

IMPERIAL CHEMICAL INDUSTRIES OF AUSTRALIA & NEW ZEALAND LTD.

IT'S BACK IN FULL SUPPLY

so now you can



with

RINGLOCK

by Cyclone

"Cyclone" Ringlock fencing can be erected in less than half the time it takes to put up an ordinary fence — fewer posts are needed — fewer holes to be bored — droppers are unnecessary — and the whole fence can be strained up in one simple operation.

Built to last a lifetime, it is particularly fire resistant and requires no maintenance.

The flexible Ringlock fastener enables the fence to follow rises and dips in the ground without twisting or breaking.

See your local "Cyclone" distributor today!

- **CHEAPEST TO ERECT**
- **LONGER LASTING**
- **FIRE RESISTANT**
- **COMPLETELY STOCK-PROOF**

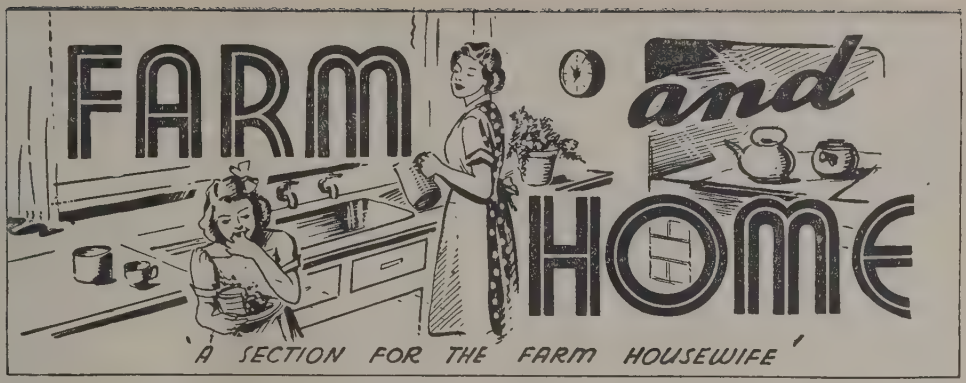
Made in the following types:

6 line 28ins. high
Sheep and Lamb Fence (10ch. rolls)

8 line 30ins. high
Pig Proof (5ch. rolls)

CYCLONE COMPANY OF AUSTRALIA LTD.

Cnr. Brown and Lime Sts., East Perth. Phone BF 1454
and at Melbourne, Sydney, Adelaide, Brisbane, Townsville



PRESSING WOOLLEN CLOTHES

By BRENDA CLEEVE

MANY women who make their own clothes find that after much painstaking work, their garments still have that "homemade" appearance. This applies particularly to woollen materials which are perhaps the hardest of all with which to achieve the "professional look."

The secret of obtaining this well-finished appearance lies largely in the pressing. Careful, thorough pressing at each stage of a garment can make a vast improvement to the finished result of home dressmaking.

PRESSING

Woollen materials must never be pressed with a really hot iron as the fabric scorches easily, and shiny marks are left where the iron has been placed.

A cloth should be placed between the iron and woollen fabric to protect the surface. The cloth may be made of any white or unbleached cotton material of medium weight but it must be without patches or hems as these may leave marks on the article being pressed.

Moisture is necessary when pressing woollens so that when the iron is applied, steam is forced through the fabric. This moisture may be obtained from the cloth which can be dampened or from the garment by pressing it when it is still slightly damp if it has been washed. Many people prefer to use two cloths for pressing, one dry and one damp. The dry one is placed next to the garment and the damp one on top. The iron is placed on the cloths and left until the top (damp) cloth is dry and the steam has been forced through the fabric. The top cloth may then be removed and the garment pressed lightly over the second cloth to dry the fabric and obtain a smoother finish. This is particularly important where a sharp edge is required, as for pleats or the edges of facings and collars.

For a fluffy fabric such as flannel where a soft finish is required the steam which has been forced through the two cloths to the fabric should be patted into the material using the hand, or the back of a clothes brush or similar article. This raises the nap. Where only one cloth is used, the same principles should be applied.

After pressing, there should always be a slight dampness left in the material. If pressed until completely dry, the material is likely to look flattened and have a shiny surface. The moisture which remains must be dried out later.

Hang the garment where possible, or leave flat until dry. If the article is folded while still damp more creases will develop.

Where possible it is best to press on the wrong side of the material and only one thickness. Of course, this cannot apply to

sleeves and trousers or where an edge is faced back, so more care is necessary when pressing these. The iron should never be moved on the material. Most materials pull out of shape while damp, and heat and moisture combined with movement will cause the fabric to matt and shrink. The movement for pressing woollens should therefore be one of PRESS and LIFT to avoid these pitfalls.

Smooth out the material to be pressed and place the cloth or cloths in position. The moist cloth should only be damp, not wet. Place the iron in position and press just the area covered by the surface of the iron. To iron the next section, lift the iron and replace it on that area so that the iron is not pushed over the surface as when ironing normally. Pat the steam into each section as it is treated.

TO REMOVE SHINY MARKS

If the iron is too hot or the material has been pressed until quite dry, shiny marks may have developed over the material. These are most likely to appear on seam lines, around collars, lapels and pockets where pressing over several layers of material cannot be avoided.

To remove these marks (unless they are very severe and the cloth has been charred), place a double layer of damp cloth over the mark. Using a moderately hot iron, hold it over the cloth, so that it barely touches the surface, until a heavy steam has been raised. Beat this steam into the material immediately. For light marks only, one treatment should suffice, but in other cases two or three attempts may be required. The heavy steam is needed to raise the nap again.

As this treatment will leave the cloth fairly damp, it will probably need to be pressed lightly again under a dry cloth to obtain a better finish. Be careful, of course, not to make more shiny marks in the same place as they will be more difficult to remove.

PRESSING SEAMS

In many garments it is the pressing of the seams which distinguishes the home-made from the professional article. Wherever possible, seams should be pressed on a single layer of material. Sleeve, or skirt boards can be used to make this easier. For the person who does much dressmaking a seam board may be very useful. If a sleeve board is used make certain that the material is not stretched over the ends to give a bumpy finish.

Press seams from the wrong side to avoid the ridges which appear so readily when pressing from the right side. When pressing seams, the fabric should be ironed until practically dry for a flat finish.

With some seams, pressing with two cloths may be cumbersome so there is another method which may be more successful. This is to use a dry cloth and soap. Choose a dry piece of soap, preferably ordinary washing soap. The sliver of soap left after a cake has been used for some time and becomes too small for further use is ideal and is handy to keep in your sewing basket. A piece of soap which has been used recently is no use as it leaves a soapy line down the seam.

The soap should be rubbed down the line of machining of the seam. If it is a seam which is pressed flat and open as is commonly used on dresses and skirts, rub the soap down both sides of the machining on the wrong side of the garment. Only a dry cloth and a warm iron are needed for pressing. The heat of the iron melts the soap and, as the seam is pressed open, the edges are held flat by the soap which acts as an adhesive. Avoid using too much soap as it may show on the right side of the garment.

Any tacking threads used in the construction of a garment should be loosened when the article is pressed. Before the

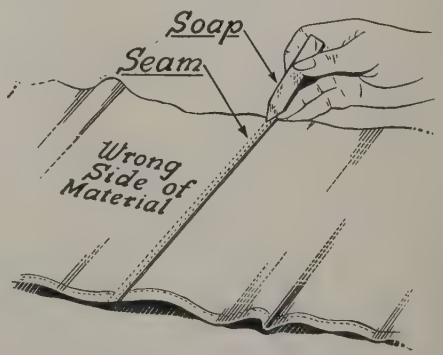


Fig. 1.—Using soap when pressing seams.

final pressing they should be removed entirely, otherwise the impressions of the thread will remain in the garment.

TO REMOVE FULLNESS

Fullness caused by easing of various seams to improve the fit of a garment may be removed by pressing. In this case the aim is to shrink the fabric by matting of the fibres. As this matting cannot be removed once it has occurred any shrinking in this way must be done very carefully. If you are not sure of the method it is wise to practice on a scrap of material first.

To shrink the fabric, place the part to be treated over the end of a sleeve board or firm pad to give the shape desired. A damp cloth should be placed under the iron which may be moved about to increase the likelihood of shrinkage and matting occurring. In this way gathers may be made to disappear. Several pressings may be necessary to achieve the desired amount of shrinkage. This method can be only be applied successfully where a moderate amount of fullness is to be removed.

SEAM BOARD

This piece of equipment makes it possible to press seams which cannot be placed on the single for pressing, without the appearance of a ridge on the opposite side of the article.

To make a seam board a piece of smooth wood 2½in. square and from 18in. to 24in. long is required. The upper edges should be rounded off to give a half cylinder of wood with a flattened top.

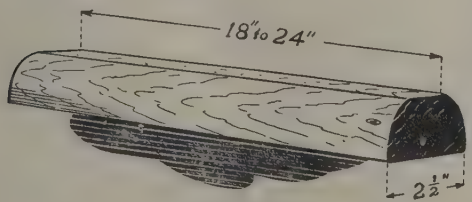


Fig. 2.—Seam board before covering.

The board should be covered with a layer of thick felt or, failing this, a piece of old blanket. The padding may be caught underneath with tacks, making sure that the points do not project above the level of the surface of the wood.

The padding may be covered with a layer of white or unbleached calico.

SLEEVE BOARD

A sleeve board is one of the most useful accessories for laundry work and dressmaking. It is handy for pressing short seams and for ironing sleeves and small fancy garments, especially babies' and children's dresses with puffed sleeves.

To make the board two pieces of wood approximately 1in. thick are necessary. The top section needs to be 18in to 24in. long and sloping from 5in. to 6in. at the end to 3in. at the other. The second piece of wood forms the base and should be 5in. or 6in. wide and 15in. long. The top section should be mounted on a block of wood measuring 4in. x 2in. x 2in. This should be set 3in. from the widest end of the top board and the same distance from one end of the bottom. The three sections should preferably be joined by screws set flush with the wood as nails tend to lossen under pressure.

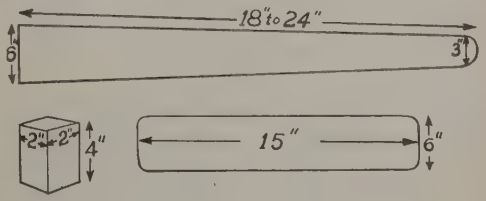


Fig. 3.—Construction details of sleeve board.

Instead of being mounted on the base the sleeve board may be bolted or hinged on to an ironing-table or skirt board.

All edges and surfaces of the wood must be thoroughly sand-papered to avoid possibility of sharp edges and corners catching delicate fabrics.

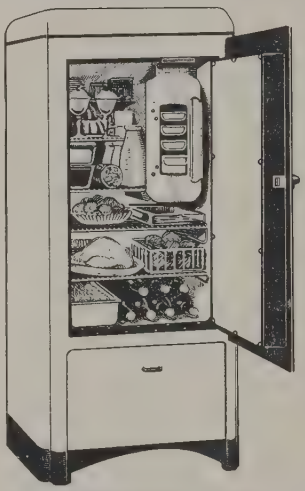
The upper section of the sleeve board must be padded. For this purpose a piece of an old blanket or thick felt may be used. Terry towelling is not suitable as it gives a bumpy surface to fabrics ironed over it.

The padding must be quite smooth and a reliable one as far as colour is concerned as the dye may run into another fabric while it is being pressed. The padding may be tacked into position and should be stretched tightly to avoid wrinkling when ironing over it.

The padding layer should be protected with a cover of some smooth fabric such as calico or duck. Avoid materials such as pique with a definite pattern as this will probably be transferred onto the cloth being ironed over it. A removable cover is ideal as it can then be washed as it becomes soiled.

Cut the top section of the padding the same shape as the top board, allowing for turnings and approximately 4in. longer at the large end. The bottom piece should be the same as the narrow end of the board and about half its length. Join the two pieces together to form a pocket which fits firmly over the narrow end of the board. Place tapes on the single end of the cover and tie these around the connecting block of wood.

ELECTROLUX REFRIGERATORS



KEROSENE OPERATED

EQUAL TO NEW

12 MONTHS GUARANTEE

EASY TERMS

PRICES FROM £54/10/- TO £89/10/-

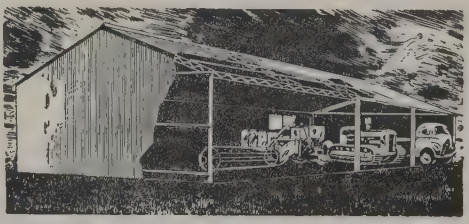
A. J. BAKER & SONS

Corner Hay & Irwin Streets, Perth — Stirling Highway, Claremont

BA 5644 F 1524

Open Fronted Implement Sheds

For use as—STORAGE SHEDS, SHEARING SHEDS, IMPLEMENT SHEDS & GARAGES



Steel Framework only or complete with Timber, Sheeting, Ridge Cap and all Fixings

Undoubtedly the strongest Agricultural type of shed on the market

COLUMNS OF ROLLED STEEL JOISTS SUPPORTING RUGGED TRUSSES OF ROLLED STEEL ANGLES

Utility Buildings have proved their sound value for every possible use. Their size and versatility solve every building problem. Designed to withstand any weather, they are a permanent guarantee as a property asset

OPTIONAL 20ft. BAY especially for Harvester Protection

UTILITY BUILDINGS PTY. LTD.

89 ST GEORGES TERRACE PERTH • B 2250 BF 1674

The Effect of Hormone-Like Herbicides on Dwalganup Subterranean Clover

By G. R. W. MEADLY, M.Sc., Officer-in-Charge, Weeds and Seeds Branch, and G. A. PEARCE, B.Sc. (Agric.), Botanist

HERBICIDES of the hormone-like group including 2,4-D and M.C.P.A. are now being used very extensively in Western Australia for the selective control of wild radish, wild turnip and mustard in cereal crops. It would be too much to expect however, that all crop and pasture plants are resistant to these chemicals and research into the tolerance of cultivated species is now being undertaken in a number of countries.

The reaction of cereals, particularly wheat, is now fairly well known but in a State so dependent on subterranean clover as a legume it is important that information should be available concerning its reaction to the various formulations, especially when first sown along with a cereal. General information has been gained by field observations in this State and some relevant material is available from experiments undertaken elsewhere, although much of the overseas work deals with species of clovers other than subterranean.

Some exploratory work undertaken in 1952 on a pasture dominated by the Dwalganup strain of subterranean clover indicated that plants, except at the small seedling stage were not readily killed by applications of 2, 4-D, many plants persisting at the 2 lb. per acre acid equivalent rate of M.C.P.A. and 1½ lb. per acre acid equivalent rate of 2, 4-D amine. It was apparent, however, that even light applications as low as 4 oz. acid equivalent per acre of both formulations retarded the date of flowering. This could be vital in districts having a short growing season as it would be equivalent to converting Dwalganup into a later strain from a maturity viewpoint and might prevent effective seed setting. Any effect of this nature would be of greatest significance in the case of spraying to control weeds in the year of clover establishment. No dormant seeds would be present in the soil and regeneration of the clover could only be obtained from seed formed in the season of sowing. As subterranean clover is frequently established along with a cereal crop which would normally be sprayed for weed control the reaction of the clover to chemicals under such conditions is most important.

An experiment was designed to ascertain the effects on seed setting of different formulations applied at various rates to Dwalganup subterranean clover sown along with a crop. It was intended to carry out the experiment at a number of different centres but conditions during 1954 restricted the work to one property in the Toodyay district on land being cropped for the first time. The clover was sown at 8 lb. per acre with a light cover crop of wheat.

The sodium salt of M.C.P.A. and the amine salt and ethyl ester of 2, 4-D were applied to the various plots as shown in the table. Each plot was 12ft. wide and 2 chains long while each treatment was replicated three times. The required amount of chemical was dissolved in water and applied at 5 gallons per acre through a low-volume boom. At the time of spraying, the crop was approximately 9in. tall and stooling freely while the clover was in the three to four leaf stage. In order to estimate the effects of the treatments 12 plant counts of one square link were made on each plot. The position of each count was marked and at the end of the

season the seed was removed from the individual areas. In this way the seed set by over 2,500 plants was recorded.

TABLE SHOWING SEED FORMATION.

Treatment.	Chemical.	Oz. Acid Equivalent per Acre.	No. of Seeds Set per Plant.
1	M.C.P.A.....	4	6·6
2	M.C.P.A.....	8	8·5
3	M.C.P.A.....	12	7·0
4	M.C.P.A.	16	7·4
5	M.C.P.A.....	24	3·2
6	M.C.P.A.....	32	4·9
7	2, 4-D amine	4	5·7
8	2, 4-D amine	8	4·3
9	2, 4-D amine	12	2·1
10	2, 4-D amine	16	1·0
11	2, 4-D amine	24	0·8
12	2, 4-D amine	32	0·6
13	2, 4-D ester	4	3·1
14	2, 4-D ester	8	3·0
15	2, 4-D ester	12	1·4
16	2, 4-D ester	16	0·9
17	2, 4-D ester	24	1·1
18	2, 4-D ester	32	1·0
19	Control	....	8·7

Significant difference between treatments (P=0·05) = 3·35.

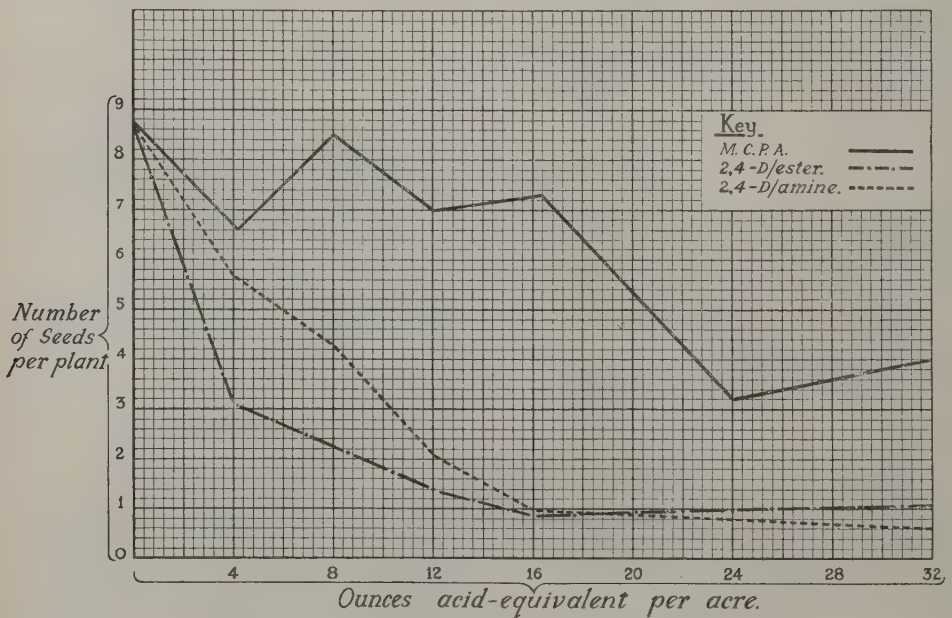
RESULTS

The results are summarised in the table and illustrated by the graph. With M.C.P.A. the yield of seed per plant was significantly depressed for all treatments above the 16 oz. level. In the case of 2, 4-D amine the depression occured with all treatments above the 4 oz. level, while with the 2, 4-D ester all treatments caused a significant reduction in seed yield.

Details concerning the plant counts have not been included in this report as they are somewhat inconclusive and it was considered advisable to await the results of the series of trials being undertaken at different centres during 1955.

SUMMARY AND CONCLUSIONS

With an experiment undertaken at Toodyay, considerable variation in seed formation of the Dwalganup strain of subterranean clover resulted from the application of M.C.P.A. (sodium salt) and 2, 4-D ester and amine at various rates. The same experiment is being repeated at a number of different centres to ascertain the effects of local conditions, particularly with reference to length of growing



Graph showing seed formation in relation to acid equivalent applied.

season, on both seed setting and clover mortality. In the meantime the following are tentative conclusions:—

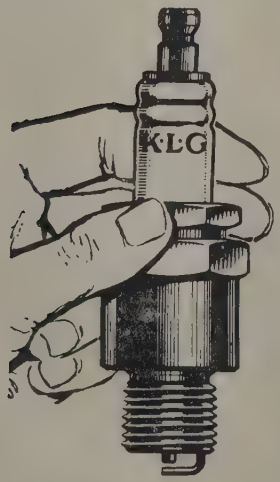
(a) Only M.C.P.A. should be used for the control of weeds growing in a crop undersown with subterranean clover. Rates of application up to 16 oz. acid equivalent per acre did not affect seed formation to any extent. Four ounces acid equivalent per acre of M.C.P.A. is sufficient for the treatment of wild turnip (*Brassica tournefortii*) but twice that amount is usually required for satisfactory results with wild radish (*Raphanus raphanistrum*).

(b) In the case of crops sown on established subterranean clover land where recovery can be expected from dormant seeds, the 6-8 oz. acid equivalent per acre of 2, 4-D amine used for wild radish control could be applied.

(c) 2, 4-D ester is favoured for the control of wild radish but affects subterranean clover to a greater extent than the other formulations and should not be used when a crop is undersown with clover. It is also likely to affect the recovery of old pastures to a greater extent than the amine.

SPECIMENS HELP DIAGNOSIS

WRITTEN descriptions of plant diseases are often insufficient for accurate diagnosis. Send specimens, preferably several, showing the disease at various stages. They will usually carry well if wrapped in moist newspapers and enclosed in well-ventilated containers.

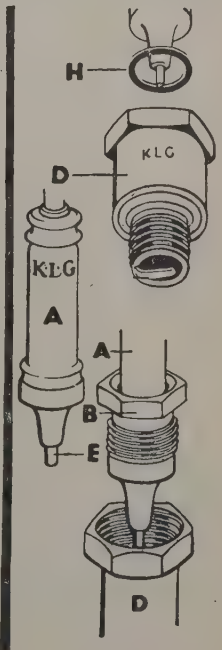


Ensure maximum "SPARK" with

K·L·G

DETACHABLE PLUGS

Most K.L.G. plugs are detachable types, cleaned easily by hand. For maximum efficiency clean every 5,000 miles (more frequently if engine is oily). To dismantle, unscrew Gland Nut (B) from the Body (D) so that the Insulated Electrode assembly (A) may be withdrawn. If the "Corundite" insulation is oily wash in petrol or kerosene; then with fairly coarse glass paper remove carbon deposit and wash again. Clean Firing Point (E) with a fine emery cloth.
Scrape Plug Body (D) clean internally with a knife or wire brush; pay particular attention to Earth Electrodes and finally rinse in petrol. Lightly smear the internal washer (H) with thin oil. Ensure correct seating in Plug Body before reinserting Central Electrode Assembly. Screw the Gland Nut and tighten to give a gastight joint. Adjust gaps in accordance with the engine maker's instructions.



K·L·G

Recommendation Booklet post free from
Box 4911, G.P.O., Sydney.
S. SMITH & SONS (AUSTRALIA) PTY. LTIMITED

A SMITH'S Service for wiser motoring

AN EXCAVATING TASK FORCE

The Nuffield Universal Tractor shown excavating with a front-mounted loader, hydraulically operated from the internal hydraulics.

NUFFIELD
UNIVERSAL TRACTOR

NUFFIELD UNIVERSAL TRACTOR

The Nuffield Universal is a thoroughly efficient, reliable and easy-to-handle tractor. It is a Task Force in itself and, combined with the comprehensive range of "approved-after-test" matched implements, speeds up your work . . . makes it easier.

DO YOU KNOW THESE MONEY-SAVING FACTS?

The Nuffield Universal Tractor (kerosene-powered), equipped with 14 x 30 rear and 7.50 x 18 front tyres on cast wheel centres, sells at only

£1,162/18/-

F.O.R., F.O.B. Capital Cities

At this price your Nuffield tractor is ready to go to work, and includes the following equipment; Hydraulic lift, 3-point linkage and power take-off, belt pulley, drawbar, drawbar extension, seat cushion, canvas tractor cover, electric starter, electric horn, headlight, agricultural rear light, tail light, side lights, heat gauge, hour meter, foot plates, chaff screens and radiator shutters. (Pressed type wheels fitted with above tyres are also available at less cost.)

Sold and Serviced by Authorised Nuffield Distributors and Dealers Everywhere

Distributors in West Australia:

PARK LANE MOTORS PTY. LTD.

926-928 Hay Street, PERTH

BMC

PRODUCE FOR PROSPERITY

NUFFIELD (AUSTRALIA) PTY. LTD., A UNIT OF THE BRITISH MOTOR CORPORATION (AUSTRALIA) PTY. LTD.

NT.31.32WA

LIBRARY SERVICE OF W.A.

BOOKS... *for FARMERS*

THE following books on agriculture have been added to the stock of the Library Board of W.A. and can be borrowed freely from public libraries in the following districts:—York, Preston, Moora, Wongan-Ballidu, Quairading, Augusta-Margaret River, West Arthur, Drakesbrook, Plantagent, Nyabing-Pingrup, Mingenew, Lake Grace.

GENERAL.

AGRICULTURAL ECONOMICS, by B. H. Hibbard. N.Y., 1948.

CROPS IN PEACE AND WAR: THE YEARBOOK OF AGRICULTURE, 1950-1951. United States Department of Agriculture. Washington, 1951.

PLANTS FOR MAN, by R. W. Schery. Lond., 1954.

MARKETING: THE YEARBOOK OF AGRICULTURE, 1954. United States Department of Agricuture. Washington, 1954.

TEACHING VOCATIONAL AGRICULTURE, by E. W. Garris. N.Y., 1954.

AGRICULTURAL MACHINERY.

ENGINEERING IN AGRICULTURE, by P. H. Southwell. Lond. 1955.

FARM ENGINES AND TRACTORS, by H. E. Gulvin. N.Y., 1953.

MAKING MECHANISED FARMING PAY, by F. Henderson. Ipswich, 1954.

RURAL ELECTRIFICATION ENGINEERING, by U. F. Earp, N.Y., 1950.

TILLAGE IMPLEMENTS, by G. C. Mouat and F. Coleman. Lond., 1954.

BEEKEEPING.

QUEEN REARING, by H. H. Laidlaw and J. E. Eckert. Hamilton, Ill., 1950.

QUEEN REARING, by L. E. Snelgrove. 2nd ed. Bleadon, Somerset, 1949.

SWARMING: ITS PREVENTION AND CONTROL, by L. E. Snelgrove. 9th ed. Bleadon, Somerset, 1946.

DAIRYING.

A DICTIONARY OF DAIRYING, by J. G. Davis. 2nd ed. Lond., 1955.

PRINCIPLES OF MILK PRODUCTION, by W. B. Nevens. N.Y., 1951.

SUCCESSFUL DAIRYING, by C. B. Knodt. N.Y., 1954.

A TEXT BOOK OF DAIRY CHEMISTRY, by E. R. Ling. 2nd ed. Lond., 1944-5.

DISEASES AND PESTS.

CROP PROTECTION, by G. J. Rose. Lond., 1955.

DISEASES OF FIELD CROPS, by J. G. Dickson. N.Y., 1947.

INSECT CONTROL BY CHEMICALS, by A. W. A. Brown. N.Y., 1951.

INSECTS: THE YEARBOOK OF AGRICULTURE, 1952. United States Department of Agriculture. Washington, 1952.

PLANT DISEASES: THE YEARBOOK OF AGRICULTURE, 1953. United States Department of Agriculture. Washington, 1953.

FRUIT GROWING AND FORESTRY.

APPLIED FOREST MANAGEMENT, by P. E. Bruns. Missoula, Montana, 1954.

CHERRIES AND CHERRY PRODUCTS, by R. E. Marshall. N.Y., 1954.

COLOR HANDBOOK OF CITRUS DISEASES, by L. J. Klotz and H. S. Fawcett. 2nd ed. Berkeley, 1948.

FOREST PRODUCTS: THEIR SOURCES, PRODUCTION, AND UTILISATION, by A. J. Panshin *and others.* N.Y., 1950.

FORESTS OF FRANCE, by J. L. Reed. Lond., 1954.

THE FUNDAMENTALS OF FRUIT PRODUCTION, by V. R. Gardner *and others* 3rd ed. N.Y., 1952.

PRINCIPLES OF SILVICULTURE, by F. S. Baker. N.Y., 1950.

AN INTRODUCTION TO AMERICAN FORESTRY, by S. W. Allen. 2nd ed. N.Y., 1950.

WOODLAND MANAGEMENT, by W. E. Hiley. Lond., 1954.

LIVESTOCK AND PASTURES.

AMERICA'S SHEEP TRAILS, by E. N. Wentworth. Ames, Iowa, 1948.

BRITAIN CAN BREED IT. 2nd ed. Lond., 1949.

BRITISH POULTRY STANDARDS, "Poultry World." Lond., 1954.

METHODS OF SURVEYING AND MEASURING VEGETATION, by D. Brown. Farnham Royal (Bucks.), 1954.

SWINE PRODUCTION, by W. E. Carroll and J. L. Krider. N.Y., 1950.

SOIL AND CROP MANAGEMENT.

ALTERNATIVE TO DEATH: THE RELATIONSHIP BETWEEN SOIL, FAMILY AND COMMUNITY, by G. V. Wallop, 9th Earl of Portsmouth. Lond., 1943.

CHEMICALS, HUMUS, AND THE SOIL, by D. P. Hopkins. Lond., 1945.

ELEMENTS OF SOIL CONSERVATION, by H. H. Bennett, 2nd. ed. N.Y., 1955.

LAND DRAINAGE AND RECLAMATION, by Q. C. Ayres and D. Scoates. 2nd ed. N.Y., 1939.

MAN AND THE LAND, by L. D. Stamp. Lond., 1955.

METHODS OF PLANT BREEDING, by H. K. Hayes and F. R. Immer. N.Y., 1942.

PROPAGATION OF HORTICULTURAL PLANTS, by G. W. Adriance and F. R. Brison. N.Y., 1939.

SOIL AND CIVILIZATION, by E. Mitchell. Syd., 1946.

SOIL FERTILITY AND THE USE OF FERTILISERS, by L. T. Lowe. Worcester, 1954.

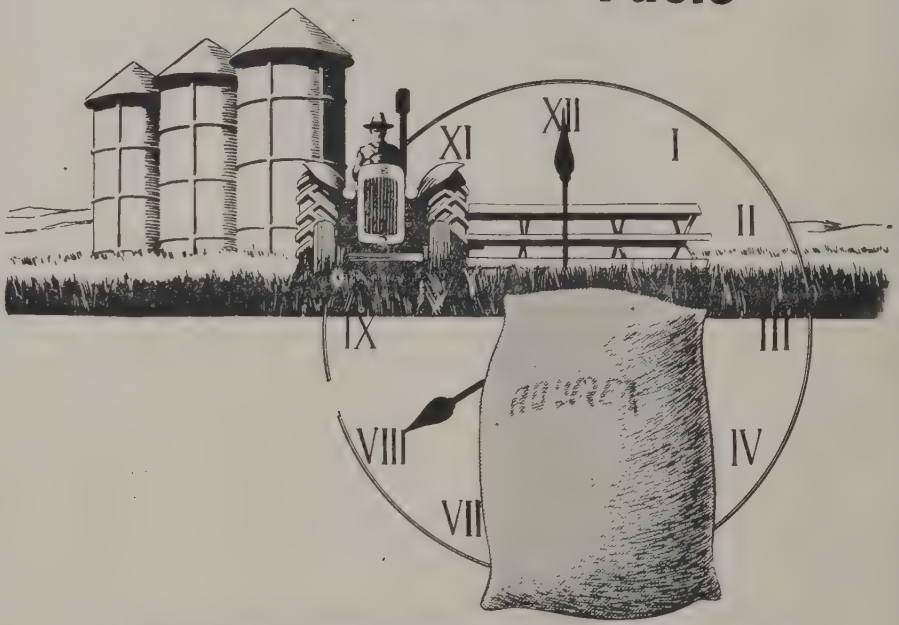
SOILLESS GROWTH OF PLANTS, by C. Ellis and M. W Swaney. 2nd ed. N.Y., 1947.

SOILS AND SOIL MANAGEMENT, by A. F. Gustafson, N.Y., 1941.

SUNFLOWER FOR FOOD, FODDER AND FERTILITY, by E. F. Hurt. Lond., 1946.

USING AND MANAGING SOILS, by A. F. Gustafson. N.Y., 1948.

TAKE OFF MORE GRAIN PER HOUR-PER GALLON OF MOBIL Tractor Fuels



You can harvest more at less cost when your tractor uses a Mobil fuel—Mobil Power Kerosene or Mobil Distillate—the fuels specially refined to develop and maintain the greatest power in your tractor

Mobilpower Kerosene
Mobil Distillate

VACUUM OIL CO. PTY. LTD. (Inc. In Aust.)

SPRING SOWN OATS FOR HAY

VARIETY TRIAL DENMARK RESEARCH STATION, 1954

By F. E. RYAN, B.Sc. (Agric.), Agrostologist

AN experiment was conducted at the Denmark Research Station in 1954 to compare the value in hay production of six early, and mid-season oat varieties, sown in early spring.

The six varieties used in the trial were Fulghum, Ballidu, Orient, Wongan, Avon (W.29) and W.32, all varieties being replicated five times in a randomised block design, on a soil type classified as Wakundup gravelly sand.

The land was ploughed and cultivated in the autumn (March, 1954) and left in fallow until August 23, when it was cultivated and worked down for a seedbed.

The plots were sown on August 24, by means of a drill.

Seeding rates were 2 bushels (80 lb.) of seed; 1½ cwt. superphosphate plus 3 lb. zinc oxide and 12½ lb. copper ore, to the acre.

GROWING CONDITIONS

After seeding on August 24, the weather remained unusually hot and dry for this district, with only light falls of rain. All varieties were somewhat backward in growth up to the end of September when good finishing rains brought rapid recovery and excellent growth.

RESULTS

Details are given in tabulated form and it will be seen that three varieties—Fulghum, W.32 and Avon were superior to the remaining varieties giving 46.0, 43.9 and 42.5 cwt. to the acre respectively as against 27.5, 25.4 and 24.3 cwt. to the acre for Ballidu, Wongan and Orient.

There were no significant differences in yield between Fulghum, W.32 and Avon but, in the actual yields obtained, Fulghum recorded the highest average.

Fulghum seed is readily available through ordinary commercial channels and appears well suited to the Denmark district for both autumn and spring sowings.

MATURITY

When spring-sown, all varieties tended to reach maturity at about the same time—only seven days separating the earliest and latest of them. Wongan was the earliest variety to mature and Orient and Avon (W.29) were the latest.

DENMARK RESEARCH STATION.
SPRING SOWN OAT VARIETY EXPERIMENT, 1954.

Average Haystage Yields.

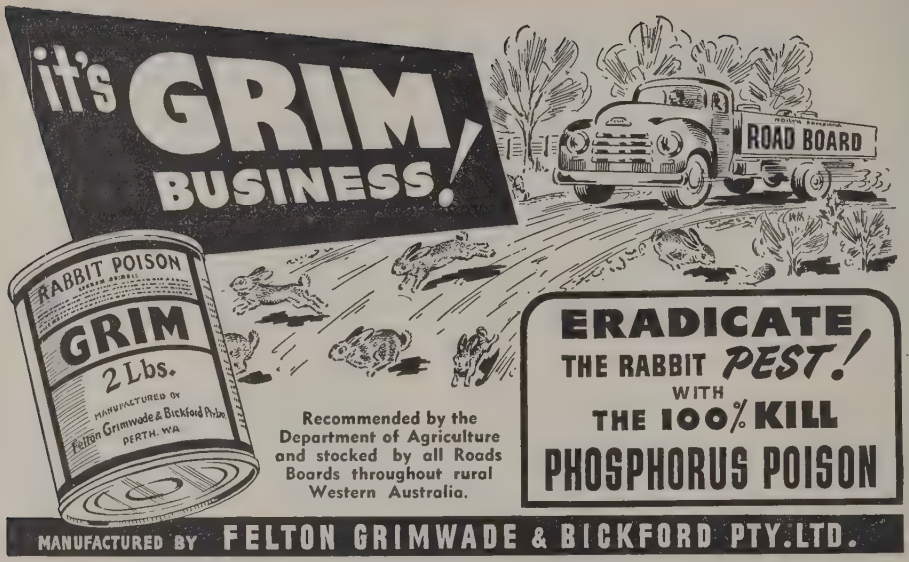
Soil Type—Wakundup Gravelly Sand.

Sowing Date—August 24, 1954.

Fertiliser—1½ cwt./acre superphosphate plus 3 lb./acre zinc oxide plus 12½ lb./acre copper ore.

Rate of Seeding—2 bushels (80 lb.) per acre.

Variety.	Cutting Date (Milky Stage).	Air Dry Yields.	
		cwts./acre.	Percentage of Fulghum.
Fulghum	25-11-54	46·0	100
W.32	25-11-54	43·9	95
Avon (W.29)	29-11-54	42·5	92
Ballidu	25-11-54	27·5	60
Wongan	22-11-54	25·4	55
Orient	29-11-54	24·3	53
General Mean	....	35·0	76
Variation Co-efficient percentage of G.M.	....	4·7	....
I.S.D. 1%	....	6·5	....
5%	....	4·8	....

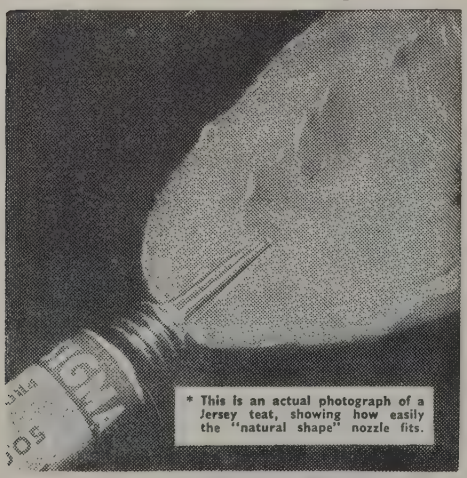


PROVED and IMPROVED *because . . .*

THOUSANDS OF DAIRY FARMS THROUGHOUT AUSTRALIA

. . . use . . .

SIGMA *PENIJEC*



★ SIGMA PENIJEC is the MASTER Treatment for MASTITIS.

★ SIGMA PENIJEC has contained procaine penicillin since 1949 when it was found that procaine penicillin proved more effective in the treatment of mastitis.

★ SIGMA PENIJEC is easier to use . . . packed in "easy-squeeze" tubes which are not affected by varying weather conditions . . .

And here are some more hard hitting facts why SIGMA PENIJEC for the treatment of mastitis is a byword with thousands of Dairyfarmers—

NATURAL SHAPE NOZZLE.
As photographed on left the "natural shape*" nozzle fits easily into the teat without damaging it, and SIGMA PENIJEC is injected by simply squeezing the tube.

PACKED UNDER STRICT SUPERVISION.
SIGMA PENIJEC is packed under strict supervision thus ensuring a product of the highest quality.

TWO STRENGTHS.
Regular—50,000 units.
Strong—110,000 units.
SIGMA PENIJEC hits hard and gives greater economy.

SOLD ONLY BY CHEMISTS.
Ask for Sigma Penijec and get the BEST for only 12/6 per dozen.

Refuse all substitutes

PREPARED IN THE PENICILLIN LABORATORIES OF

SIGMA

SIGMA CO. LTD.
MELBOURNE
SP22HP

SORGHUMS FOR GRAIN AND FODDER IN THE SOUTH–WEST

By F. E. RYAN, B.Sc. (Agric.), Agrostologist

Fig. 1.—Portion of the Grain Sorghum Variety trial plots at the Denmark Research Station.

THE high yields of sorghum grown for fodder and grain at the Denmark and Wokalup Research Stations suggest that these crops can play an important role in the higher rainfall areas of the State. As a source of green fodder, sorghums could take the place of maize during the summer months. Where the crops are not grazed, they could produce grain for feeding to dairy stock and pigs.

A total of 68 demonstrations, involving either grain or fodder sorghum have been carried out in the higher rainfall areas during the past six years and the following is a review of the results reported.

GRAIN SORGHUM

During the five summer seasons 1949-50 to 1953-54, a total of 27 demonstrations involving grain sorghums were sown in the dairying areas.

Varieties.

In 1949, Wheatland was the only one used for this purpose. In 1950 Hegari was used, and later as the result of experiments on the Research Stations, Martins, Alpha and Early Kalo were used.

Wheatland variety was found to be somewhat late in maturity for most districts and better results were obtained from Alpha and Early Kalo which are somewhat earlier in maturity. The date of maturity is dependent on the time of sowing and in the demonstrations under review many crops were planted too late. When planted in November, grain ripened by the end of March or early April.

Districts.

The demonstrations were arranged in most dairying districts as shown in Table 1.

Table I.

SORGHUM DEMONSTRATION—GRAIN TYPE.

Year.	Metropolitan-Pinjarra.	Harvey-Brunswick.	Bunbury-Donnybrook.	Busselton-Margaret River.	Bridgetown-Boyup Brook.	Manjimup-Northcliffe.	Denmark-Albany.	Darkan-Collie.	Total.
1949–50	1	1	1	3	3	....	1	1	11
1950–51	1	1	1	1	....	1	....	....	5
1951–52	....	....	....	3	....	....	3	....	6
1952–53	....	....	....	3	....	....	....	....	3
1953–54	....	....	1	....	....	....	1	....	2
Total	2	2	3	10	3	1	5	1	27

The heavy rainfall areas such as Busselton, Margaret River, Denmark, Albany were found most suitable and most demonstrations were arranged in these districts. Success of this demonstration was not limited, however, to the higher rainfall areas and good results were obtained at Darkan, Boyup Brook, Bridgetown and Bunbury as well as Margaret River and Denmark.

It is obvious that ploughing the land sufficiently early in the spring to conserve adequate moisture enables this crop to be grown successfully in any of the dairying districts.

Utilisation.

All farmers experienced difficulty in making use of the grain sorghum crop. Practically no harvesting machinery is available in the dairying areas with the exception of one or two districts. For this reason, the crop cannot be harvested in the usual way.

Farmers were not willing to cut and stack this crop after the seed had matured, but a number of them made use of the crop by turning either pigs or stock into the matured sorghum and allowing them to harvest the grain themselves. Where this was done, good results were recorded. The utilisation of the crop by this method tends to limit its usefulness to a short period, but as this is the autumn period when feed is not readily available, it still must be considered a means of providing grain for stock at this time of the year.

Causes of Failures.

About 50 per cent. of the demonstrations arranged were unsuccessful for various reasons. These may be reviewed as follows:—

Time of Ploughing.

The most important cause of failure was the effect of drought and this is closely allied to the time of ploughing. In order to conserve sufficient moisture in the soil for the growing of this crop, the land must be ploughed and fallowed in the early spring. Frequently in these demonstrations, this was delayed until the time of sowing at the end of November-December or in some cases in January.

On summer-moist land or land which retains its moisture late, it may be possible to plough and seed down in December, but generally ploughing and cultivation should take place during the spring when the land is supplied with adequate soil moisture.

Time of Sowing.

In many cases, the planting of this crop was delayed until the end of December or early January. This does not allow sufficient time for the seed to mature before the onset of cool and wet conditions in the autumn. The most successful time of planting appears to be in November and where adequate preparation has been given and the crop planted in November, the grain ripened by the end of March or early April.

Poor Soils.

In a few cases, poor soils, very sandy in nature or newly cleared, were chosen. These areas were not able to support a heavy crop of sorghum. In a few cases, copper, zinc and potash deficiencies caused the poor crops.

Seed.

In one year, almost all demonstrations failed, because of poor seed. Owing to the difficulty in obtaining fresh seed, stocks held over from the previous year were used. Some weevil damage occurred and a very poor germination was obtained from this seed. It is obvious that for this crop, fresh supplies of seed are needed if the crop is to succeed.

Varieties for the South-West.

Hegari, Alpha and Early Kalo varieties are shorter in their growing period than Wheatland and Martins and proved more satisfactory for the purposes of this demonstration. Early maturing varieties are necessary if the crop is to mature before the onset of the autumn rains.

FODDER SORGHUM

Maize has been a standard fodder crop for many years on dairy farms, but requires a fertile soil well supplied with moisture for best results. The fodder sorghums, particularly Saccaline and Italian have become prominent in recent

years as alternative crops for this purpose and are more drought resistant than maize. They can be grown on somewhat poorer conditions than is necessary for a maize crop.

They also have the capacity for regrowth following cutting, which provides an extension of the period when they supply green fodder, and the second growth results in an increase in the total yield.

In some respects, fodder sorghums occupy a place among the fodder crops intermediate between Sudan grass, which is grown for grazing, and maize which is grown for cutting. The sorghums can be cut at first flowering and the regrowth grazed.

Forty-one demonstrations have been carried out during the last five years to test the value of this crop in comparison with both maize and Sudan grass and the following reviews the results reported.

Varieties.

The two varieties commercially available in this State are Saccaline and Italian sorghums. On most areas, Saccaline was the best variety in these demonstrations, although very good results were obtained on some sites with Italian. Saccaline is the coarser variety of the two and both are relished by stock.

Districts.

Saccaline was found suitable for all districts and good crops were obtained at all centres. The distribution is shown in Table II.

A number of failures occurred in the Busselton-Margaret River area but these are attributed to the choice of sandy soils which have since been found lacking in copper, zinc and potash. In this district, good crops have been produced on more fertile soils not affected by these deficiencies.

Comparison with Maize.

On fertile areas under irrigation or well supplied with moisture during the summer months, maize was found to be more productive of bulk than Saccaline but in drier situations and in the lighter rainfall areas of the dairying districts, Saccaline was found equal to, or more productive than, maize. This indicates that greater drought-resistance of Saccaline sorghum can be used to increase the area available for summer cropping on dairy farms.

In a number of instances, the regrowth following cutting was found to provide a considerable additional amount of green fodder and this was grazed off. This ability for regrowth was not shown to any degree by maize. Under highly fertile conditions, maize is preferred, but on the less fertile soils and particularly on slightly drier soils, Saccaline has given better results.

Comparison with Sudan Grass.

Sudan grass and Japanese millet are summer crops primarily grown for grazing and two, three or more grazings may be obtained during the season dependent on the soil moisture.

Table II.

SORGHUM DEMONSTRATIONS—FODDER TYPE.

Year.	Perth-Pinjarra.	Harvey-Brunswick.	Bunbury-Donnybrook.	Busselton-Margaret River.	Bridgetown-Boyup.	Manjimup-Northcliffe.	Denmark-Albany.	Darkan-Collie.	Total.
1949–50	4	1	4	4	1	1	....	2	17
1950–51	....	2	1	1	1	....	1	1	7
1951–52	....	....	....	4	1	....	3	....	8
1952–53	....	....	....	4	....	....	1	....	5
1953–54	....	....	2	2	....	....	....	....	4
Total	4	3	7	15	3	1	5	3	41

Fig. 2—Saccaline, one of the most popular varieties of fodder sorghum. (Queensland Agricultural and Pastoral Handbook).

In some demonstrations, Saccaline sorghum was grazed in the same manner as Sudan grass. Under these conditions it made poor recovery after grazing. Sudan grass is much more satisfactory under such grazing management. Saccaline, however, provides a bulk of fodder for cutting and makes considerable regrowth after cutting which can be grazed.

Comparison with Grain Sorghum.

Saccaline and Italian sorghum are much more productive of green fodder than grain sorghums and as grain production is not usually an important consideration, these fodder sorghums are much more attractive for fodder than the grain sorghums.

If the summer crops are grown for fodder production, it is better to use either maize or one of the fodder sorghums or if grazing is required then Sudan grass, but if grain production is the aim, then grain sorghums may be used.

CONCLUSIONS

The use of fodder and grain sorghums is being demonstrated in all dairying districts. The fodder sorghums, Saccaline and Italian, can be successfully grown in all these districts and are adaptable to poorer soil and moisture conditions than is necessary for maize. They are able to produce a large bulk of green forage which is very palatable to stock and have the ability to make considerable regrowth following cutting. Best results in these demonstrations have been obtained from the Saccaline variety.

One of the most important factors determining the success of these summer fodders is the conservation of soil moisture which depends on ploughing and fallowing of the soil in the early spring when adequate moisture is present in the soil.

The use of grain sorghums as a crop in dairying areas is limited by the lack of harvesting machinery. The standing crop may be fed to pigs or cattle after maturity

in the autumn and constitutes a valuable source of grain and forage during this time. Most farmers are not equipped to harvest and store seed for use at other periods of the year. The varieties commercially available are generally slightly late in maturity, but Early Kalo, Alpha and Hegari are suitable if planted sufficiently early in November. Later planting does not allow the seed to ripen before the onset of cool and wet weather in the autumn. Yields of 50 bushels per acre have been recorded in some demonstrations.

Breeders: **Australorp, White Leghorn, 1st Cross**

DAY OLD CHICKS:

Unsexed, Pullets and Cockerels when available

APRIL to OCTOBER DELIVERY, Freight Free

Air Freight Extra

6 WEEKS-OLD PULLETS

MAY to NOVEMBER DELIVERY

Plus Freight and boxing

All from Government Blood Tested

PROVED SECOND SEASON STOCK

HATCHERY:

Cnr. EPSOM AND SMITH AVENUES,

REDCLIFFE PARK - - - - ML 543

APHIDS ARE NOT THE MENACE THEY WERE

They are easily controlled with the new fast-acting

'GAMAPHEX'

Benzene Hexachloride Insecticide

This powerful I.C.I. Spray gives you certain protection against these troublesome pests, yet, because it is made from purified, odourless, Benzene Hexachloride (BHC) it does not taint fruit!

'GAMAPHEX' is economical too — 1½ pints make 100 galls. of spray for the commercial grower or 2 oz. make 6 galls. for the home gardener.

APPLE GROWERS NOTE

'GAMAPHEX' is particularly effective for control of Woolly Aphids while the fruit is on the tree.

'GAMAPHEX' also controls Slatey Grey Cabbage Aphids and Green Peach Aphids on Cabbages, Cauliflowers, Brussels Sprouts, Broccoli. Aphids on Beans and Peas. Aphids on Citrus Trees. Aphids on Flowers and Shrubs.

Available in 2 oz. or 1 pint bottles from your Usual Supplier

GAP.2X.1170

A DEPENDABLE PLANT PROTECTION PRODUCT

IMPERIAL CHEMICAL INDUSTRIES (ICI) OF AUSTRALIA & NEW ZEALAND LTD.

'Phenovis'—Brand of Phenothiazine.

USED and RELIED UPON THE WORLD OVER!

"FINE PARTICLE SIZE"

PHENOVIS

BRAND OF PHENOTHIAZINE

in liquid, powder or tablet form

The most effective drench for worms in sheep!

Available NOW from Your Usual Supplier

IMPERIAL CHEMICAL INDUSTRIES OF AUSTRALIA AND NEW ZEALAND LIMITED

ICI

PHE.35X.1118

Please mention the "Journal of Agriculture, W.A.," when writing to advertisers

FOWL POX

By P. M. A. HARWOOD, M.R.C.V.S.,
Veterinary Surgeon

Fig. 1.—A severe case of the eruptive form of fowl pox.

FOWL pox is a highly infectious disease of poultry which has been recognised for many years. It occurs in all poultry raising districts, but may be more prevalent in certain years. In Western Australia, it is customary to vaccinate commercial flocks and this practice has greatly reduced the incidence.

All breeds of fowls are susceptible but birds with large combs are more frequently affected hence White Leghorns usually suffer more than heavy breeds.

Birds of any age are susceptible. However, birds over one year are seldom affected, having acquired an immunity the previous year.

It occasionally occurs in very young chicks, mainly those which are very early (April or earlier) or late hatched and which are affected by the seasonal influences prior to vaccination.

SEASONAL OCCURRENCE

Most outbreaks occur in summer and early autumn, although cases may be seen at any time of the year. Probably the mosquito population is a major factor in the spread of the disease.

CAUSE AND TRANSMISSION

Fowl pox is caused by a virus. Dried virus in scabs and other infective material may live for a long time in litter. Healthy birds do not carry the disease after recovery.

The dried virus in pens and runs gives a reservoir of infection, but the rapid spread of disease from bird to bird in an outbreak is usually due to spread by mosquitoes.

Outbreaks frequently occur when pullets are transferred to laying pens; probably the reason is that one or two birds become infected from the litter in these pens, whereupon mosquitoes rapidly transmit infection from bird to bird. Lice and tick may also transmit the disease.

SYMPTOMS

Three clinical types of fowl pox occur, and in one outbreak all forms are usually seen:

Fig. 2.—Plucking a few feathers from the thigh of a bird before vaccinating.

Fig. 3.—Making the needle-stabs in vaccinating against fowl pox.

(a) **Eruptive Type** (warts). Small round, raised blood-blister-like grey-coated spots appear on the combs, wattle, ear lobes and face. These spots soon dry into yellowish-brown scabs which may tend to enlarge and run together. Removal of the scab reveals a raw bleeding surface. Only a few of these spots may develop but in rare instances all unfeathered parts of the body are affected. Usually the more spots that are present, the more serious the attack. In more serious cases there is loss of appetite, drop in production and sometimes death.

(b) **Diphtheritic Type** (canker). This type of fowl pox affects the mucous membranes of the mouth and throat. Yellowish sores are formed in the mouth and the angle of the beak. The canker material is firmly attached and generally spreads until large portions of the tongue, mouth, throat and windpipe are affected. Affected birds lose weight and may die. Although recovery can take place, there is a long period of unthriftiness.

(c) **Oculo-nasal Type** (roup). This type of fowl pox affects principally the eyes. The eyelids become swollen and inflamed, and the eye is closed and protruding. A plug of yellow, cheesy material is present between the eyelids and overlying the eye. There is usually a discharge from the nostrils and mouth. Considerable loss of condition takes place.

PREVENTION BY VACCINATION

Fowl pox is controlled by a policy of vaccination between the 10th and 14th weeks of age. When several hatches of chickens are to be vaccinated, great care must be taken to ensure that there is no contact between chickens undergoing vaccination and younger unvaccinated groups of chickens. Various types of vaccine have been used and there are at least two reliable brands on the market. Vaccines on sale in Western Australia are sold subject to approval by the Chief Veterinary Officer and registration under the Veterinary Medicines Act.

Technique.

A two-pronged needle is used. This is dipped into the vaccine and two separate stabs into the skin are made ¼in apart. The inoculation is made into the web of the wing, the skin on the outside of the thigh, or the fold of skin at the back of the thigh. The feathers are plucked out at the site of vaccination, prior to making the needle-stabs.

Reaction to Vaccination.

(a) *Local.* A pox lesion develops at the site of vaccination, usually first appearing between the 5th and 8th days. A scab forms and persists for three to four weeks after vaccination. There may be lameness where the reaction is severe.

(b) *General.* On from the 16th to 20th day after vaccination, birds show signs of dullness and loss of appetite. Normally these symptoms persist for only one or two days.

Vaccine "Takes."

The efficiency of any vaccination programme depends on getting a very high percentage of "takes." A percentage of the flock should be examined between the 12th and 14th days after vaccination. A "take" is a definite scab formation at the site of vaccination.

If over 95 per cent of the birds show good "takes" vaccination is satisfactory, but birds showing feeble or no reactions should be re-vaccinated.

A poor "take" may be due to:—

(a) the fact that the birds have acquired immunity by prior infection,

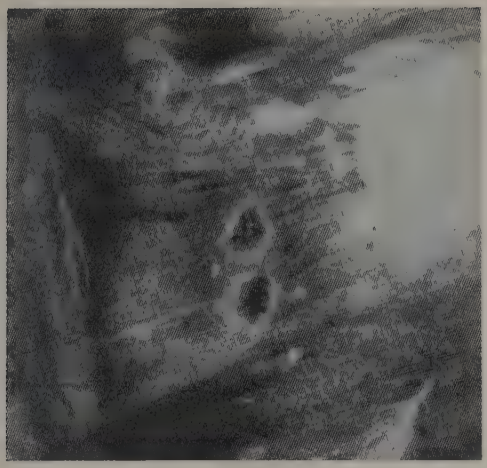


Fig. 4.—An enlarged photograph showing the scab formation of a good "take" on the sixth day.

(b) loss of potency of vaccine due to exposure to warm temperatures or direct sunlight,
(c) faulty technique or greasy vaccinating needle,
(d) vaccination of birds in poor condition.

Precautions in Vaccination.

1. Vaccine must be freshly prepared and only small quantities placed in the container used for dipping the needle. Vaccine must be covered and protected from the sun.

2. Care must be taken only to wet the points of the needle, and particularly to ensure no vaccine lies on the skin or comes into contact with the heads of the birds.

3. Only healthy birds should be vaccinated.

4. Very occasionally, deaths occur after vaccination in spite of all proper precautions.

TREATMENT

There is no specific remedy which can be used to cure fowl pox. All treatment is aimed to alleviate the severity of the disease. In the eruption type the scabs may be removed and the raw areas treated with a 10 per cent carbolic ointment. Alternatively, painting the head with tincture of iodine is beneficial. Care should be taken that the iodine does not get into the eyes. The carbolic ointment has the advantage of repelling mosquitoes.

In the canker type the canker material should be removed from the mouth with a match stick or hairpin and the affected areas painted with tincture of iodine.

In the roup type the cheesy plug can be squeezed out of the eye quite easily. The eyes should then be treated with one drop of 10 per cent. Argyrol daily.

The nostrils can be cleaned by syringing with a few drops of hydrogen peroxide—10 volumes.

When undertaking treatment of affected birds, they should always be isolated from the rest of the flock.

SUMMARY

1. Fowl pox is an infectious disease of fowls, being most serious in young birds and occurring mainly in summer and early autumn.

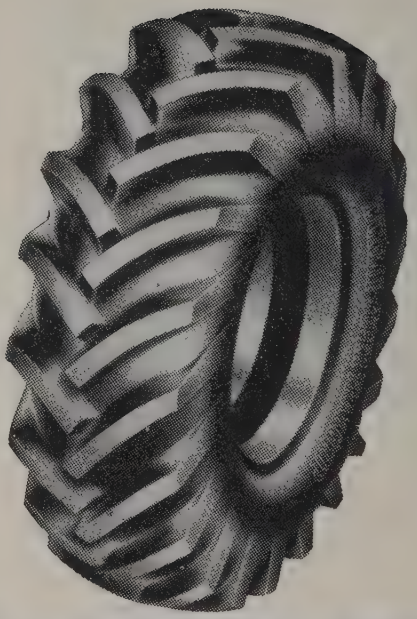
2. Symptoms are of three types:—
(a) Scabs on combs and wattle.
(b) Canker affecting mouth.
(c) Roup affecting eyes.

3. Control is effected by a policy of vaccination of all birds at 10-14 weeks of age.

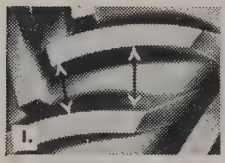
4. Proper precautions are necessary in vaccination, and birds must be examined for "takes" at 12-14 days.

better

4 big ways!

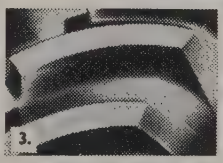


Farmers demanded these features—only one tractor tyre has them—the Australian designed, tested and proved Dunlop Super Trakgrip out-pulls, out-cleans, out-performs them all.

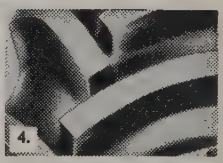


1. Open-centre tread wider at the buttress than at the centre squeezes out all trash.

2. Angle-set reinforced buttresses relieve buttress tension under extreme deflection.



3. Massive deeper and wider tread bars heavily reinforced at open centre base for immense resistance to abnormal bar distortion under load.



4. Broader treads of super-toughened rubber for long life and powerful traction.

DUNLOP

Super Trakgrip

TRACTOR TYRES

THE GREATEST GRIP ON EARTH

DTG-1369.

A NEW MODEL HOSE LEVEL

By J. E. WATSON, B.Sc., and B. a'B. MARSH, B.Sc. (Agric.),
Soil Conservation Advisers

FOREWORD

The construction and use of the Hose U-tube Level as designed by Mr. J. P. Fallon was described by him in the Sept.-Oct. 1952 issue of the Journal of Agriculture. Thus he made available to farmers the means of making a simple home-made levelling device which would give accurate and reliable results, enabling them to tackle contour surveying with confidence.

Various improvements have been made to Mr. Fallon's original design and the purpose of this article is to describe the construction and use of the most improved type of hose level.

The first section of this article was written by Mr. J. E. Watson, who did much to incorporate the many suggested improvements on the old level into the efficient and versatile level in its present form.

The second section was written by Mr. B. a'B. Marsh, who has used the level consistently under practical conditions to assess its uses and limitations as a surveying instrument and to work out a convenient method of use.

G. H. BURVILL, Commissioner of Soil Conservation.

At soil conservation schools run by the Soil Conservation Service, many farmers have had the opportunity to try out the "Hose Level" and have been impressed with its simplicity of use and accuracy. A few minutes after seeing the level for the first time farmers have surveyed contour and grade lines, which when tested with the surveyor's dumpy level, have proved remarkably accurate.

A number of farmers have constructed these levels and made good progress in doing the contour surveys required on their farms.

The principle of the hose level is that water contained in two open upright lengths of plastic waterpipe connected by a 60ft length of hose will stand at the same level in both pipes.

The design, construction and details of use of the "Hose Level" depend on a satisfactory method of providing an upright support for each piece of colourless plastic waterpipe, which will allow accurate measurement of the height above the ground to which the surface of the water rises in each pipe.

In the level designed and described by Mr. Fallon, the 4ft. lengths of the colourless plastic pipe are clamped to 6ft. lengths of light wood batten. Movable pointers are attached to each batten or staff. It was recommended that the two sections be joined with ¼in. air-hose to avoid the necessity of repeated adjustment of the pointers, because plastic garden hose is subject to considerable changes in volume in hot weather (it becomes soft and pliable and stretches). To run a contour line, the two battens are held vertically side by side on level ground. The water comes to rest at the same height in each pipe. The pointers are set at this level. One staff is held on point A and the other taken out across the slope to the extent of the connecting hose and moved up or down the slope until the water in the pipes is at the level marked by the pointers. Thus point B is found which is at the same level as point A. By then moving the hose level along and starting from B, a further point, C, can be found which is the same level as B (and as A). By continuing this process, a series of points on the ground surface can be found which are all at the same level. A line joining these points will be a level or contour line.

Much thought has been given to other systems of providing an upright support for the colourless plastic pipe. Various ideas have been tried out and modifications and improvements have been suggested by Soil Conservation Service officers and farmers.

The latest model which has been evolved from these ideas is considered to be more simply constructed and more convenient to use than the original. It allows the use of ordinary ½in. plastic garden hose instead of the more expensive air hose. Air locks are not so likely in the larger diameter hose. The 6ft. staff is quickly separated into two shorter lengths for transport in a car. All parts should be readily obtainable. A small amount of welding is required.

LIST OF PARTS REQUIRED FOR HOSE U-TUBE LEVEL

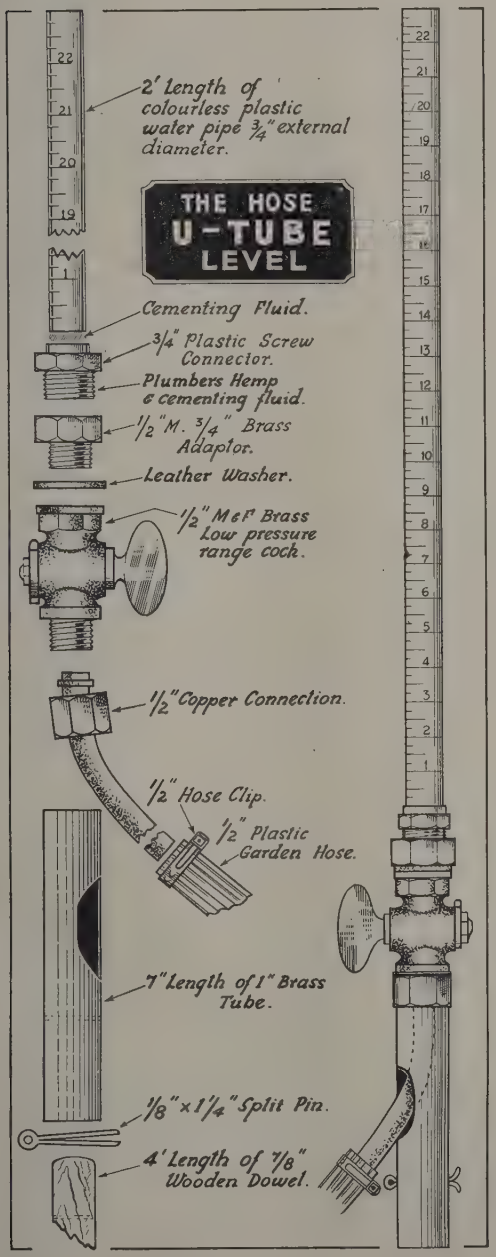
2-2ft. lengths of ¾in. colourless plastic water pipe.
2-¾in. plastic screw connectors.
Plastic pipe cementing fluid.
Small quantity of plumber's hemp.
2-½in. MF brass adaptors.
2-½in. leather washers.
2-½in. MF brass low pressure range cocks.
1-½in. Copper connection (to be cut in halves to provide a section for each staff.)
2-7in. lengths of 1in. brass tube.
2-⅛in. x 1½in. split pins.
2-½in. plastic hose clips.
2-4ft. lengths of ⅞in. wooden dowel.
1-60ft. length of flexible ½in. plastic garden hose. Some brands are more flexible than others in cold weather.

POINTS ABOUT THE METHOD OF CONSTRUCTION

The plastic pipe is often curved as it is usually in coils in the shop. To straighten, put a cork in one end, fill the pipe with boiling water and then put a cork in the other end. This will soften the tube and it can then be straightened.

The cementing fluid is necessary to fix the plastic screw connector to the end of the plastic pipe. It is also advisable to use

the cementing fluid and plumber's hemp to make a watertight joint when the brass adaptor is screwed on to the plastic connector.


2' length of colourless plastic water pipe ¾" external diameter.
THE HOSE U-TUBE LEVEL
Cementing Fluid.
¾" Plastic Screw Connector.
Plumbers Hemp & cementing fluid.
½" M. ¾" Brass Adaptor.
Leather Washer.
½" M&F Brass Low pressure range cock.
½" Copper Connection.
½" Hose Clip.
½" Plastic Garden Hose.
7" Length of 1" Brass Tube.
⅛" x 1¼" Split Pin.
4' Length of ⅞" Wooden Dowel.

The plastic pipes are graduated in inches (with halves and quarters marked also). Neat circular markings can be made by tightening a hose clip on the tube and then scratching around the top of it with a sharp instrument or small file. The numbers required can also be scratched on. If the scratches are filled in with black Indian ink, they can be easily seen.

The copper connection is sawn in halves and each half connected to a brass tap. (It may be necessary to use fibre or copper washers to ensure a watertight joint).

A hole is cut in the side of the brass tubing so that the copper tubing (when suitably curved) can be passed in one end of the tube and out through the hole in the side. This is then welded in position.

The wooden dowel is pushed into the open end of the brass tubing. An ⅛in. hole is then drilled through the tube and dowel and the split pin inserted.

When the whole staff is assembled, the dowel is sawn off to the required length (the zero marking on the colourless plastic pipe can be made to be either 4ft. 6in. or 5ft. from the ground—it doesn't matter, but both staves must be exactly the same). The dowels should then be graduated with 1ft., 6in. and 3in. markings.

PREPARATIONS FOR USE

Bubbles in a newly filled hose level must be eliminated. Hold the ends of the hose level together with taps open, unroll the loop of hose downhill and shake until no more bubbles appear and the two water surfaces stop next to one another. Small bubbles on side of tube do not matter. Make the water level up to 10in to 12in. mark and switch off taps.

Damping the movement of the water is effected by turning one tap partially off. To adjust this, raise one staff about 12in., turn one tap full on and turn the other tap slowly until water level moves steadily but slowly to equilibrium. This tap is always kept in this position while surveying.

PRINCIPLE OF OPERATION

The two ends of the hose level can be held any distance apart up to the limits set by the hose. When the ends are placed on the ground at some distance apart, and the closed tap turned on, the water comes

to equilibrium and reading can be made at each end. The difference between these readings is the difference in level between the two points on the ground where the two ends stand. If one reads 12¼in., the other 15⅝in., the difference of 3⅜in. indicates that the first staff is 3⅜in higher than the other. If this is brought downhill 3⅜in. to the same level, the water will go up on one and down in the other until they read the same at 14in. (halfway).

SURVEYING AND MARKING CONTOUR LINES

The hose level is used mainly for surveying contour lines. True contour lines are level lines with no gradient. These are surveyed by finding points at the same level every 50ft., marking each point and then joining these points with some sort of scarifier or plough furrow in the ground. The points every 50ft. may be marked by stiff wire pegs (wood is too bulky and difficult to drive in) or with a spade. The marks must be visible from 50ft., so a heap or clod of soil should be made as high as possible. In soil conservation work, such lines are used as guide lines for contour working or marking the position of pasture furrows and absorption banks.

Once the starting point of such a line is decided, a mark is put on the ground and the **rear staff** placed at this point with the tap turned off. The **leading staff** (with tap adjusted for damping) is carried 50ft. (17 to 20 walking paces according to your size. Don't try to pace yards, it is too tiring. Measure 50ft. and see how many normal walking paces it takes you.) This distance is paced roughly across the slope and the staff placed anywhere on the ground. The rear tap is immediately turned on and the water starts moving to its true level. The leading man moves up if the water moves up and vice versa. He moves the staff until his reading is the same as it was before starting the line, the staves may both have read 12in. so he moves until it reads 12in. While doing this, the rear man is **silently** watching the water till it comes back near the 12in. and becomes nearly stationary; it may read 12⅜in. and he calls this out once. The leading man hears this and knows the true reading must be halfway between the two readings 12in and 12⅜in. He moves the staff downhill a short distance till he reads 12¼in. and puts in his mark. The rear man does not have to call this out unless the leading man asks for confirmation. The rear man will get a sore throat too easily if he calls out all the time while the water is moving and the information is useless anyway.

Once the leading man puts in the peg or mark, the rear man turns off his tap and they both move on another 50ft. If the system of marking is to dig a small hole, this hole should be made on one side in the direction of the line as close as possible to the foot of the staff, but not exactly where the staff was standing. When both operators have moved on the rear man places the staff as exactly as possible where the leading staff was and turns his tap on when the leading staff is dropped. The next point is then found. Each of these points is the same height above sea level and joined up they form a contour line.

The operators will notice that the readings may vary by ¼in. to ½in. from one setup to the next. This is due to several factors and it does not matter as long as each staff reads the same.

Variations are caused by heat softening the hose and increasing its volume, the readings become lower. If the hose is looped uphill by inaccurate walking or looped over a fence, the readings will be higher. If the hose is looped downhill or hangs over a gully, the readings will be lower. Spilling of water lowers the readings.

These facts are mentioned so that you will understand the variations and see that the final result is not affected.

SOURCE OF ERROR

Mention was made, four paragraphs back, that the rear man places the staff as exactly as possible where the leading staff was. **This is very important.**

To ensure that large errors are not made by wrongly placing the rear staff, a standard method of marking should be employed. For instance, always push the peg in against the leading side of the staff. The rear staff is then placed in the same position relative to the peg. When using a spade, always push the spade into the ground in the same place relative to the

staff, e.g., with the left hand end of the cut next to the staff, turn the clod out of the hole and leave it so that the tractor driver will see it. The rear man will then place the staff at the same end of the cut.

SURVEYING GRADIENT LINES

In soil conservation works, lines with a slight grade or slope are often required. These are also called contour lines, even though they have a gradient from one end to the other. They mark the positions of banks which are used to take water from unsafe or inconvenient waterways to safe, grassed waterways and also for taking water to dams from other catchments or creeks.

To survey these lines, use the same method as for true contour lines. A little more thought must go into the starting point and keep in mind that the banks should never discharge onto ground used for cultivation, or directly into a gully.

Instead of getting the same reading in each staff, the two readings must differ by the actual amount of the fall. The downhill staff must always read higher. It is still not necessary for the rear man to call out more than once or twice, although more often the leading man does require confirmation of the final reading.

SAFE GRADIENTS

Use this general procedure.

Use grades of ½in. to 2½in. in 50ft.

When you start at the outlet or waterway end of the bank, start on a grade of 2in. or 2½in., less if the erosion is not serious. At each erosion gully to be crossed, or at intervals of about 500ft., decrease the grade by ½in. At the last gully crossing, or when within 10 chains of the end of the bank, it is usually safe to use a true contour line, but put the last mark uphill about 4in.

When you start at the top, or high end, of the bank, use the true contour for several chains until you cross the first gully—increase the grade ½in. at every gully crossing. Don't use a grade of more than 3in. in 50ft. Steeper grades will gully.

In order to carry water without scouring, a bank should be about 18in. high with a broad flat channel at least 6ft. wide across the bottom. Vee-drains carry too little water too fast and are totally unsatisfactory.

To run water efficiently, into a dam for instance, use fairly steep grades, e.g., 3in. in 50ft. The section of 10 chains furthest from the dam may be put on a 6in. in 50ft. fall, unless it will obviously pick water up in any quantity.

DODGING OBSTRUCTIONS

It becomes apparent soon after you start surveying, that rock heaps, trees and whitegum roots often occur on the line you are surveying. These obstructions prevent efficient construction of banks. If obstructions are not extensive they can be dodged by steepening the grade of the bank over a short distance.

Survey the line past the obstruction to make sure if it really is on the line and in the way. Place rear staff above or below the obstruction so that the line becomes steeper. If you are travelling downhill along the line, go below the obstruction and vice versa. Measure the vertical interval from this new point to the last peg; if this is more than 18in., re-run the complete line **starting below or above this difficult part.** If the vertical interval is less than 18in., run the line back the way you have come, on a grade of 5in. in 50ft., until you intersect the original line, delete the unwanted points and then continue the line on the normal grade.

OTHER USES

Rough Distant Sighting.

For finding points at a distance on the same level, we use instruments with which one can look along a horizontal line, for example, the dumpy level consists of a telescope kept level by a very accurate spirit level. One can also use a carpenters' spirit level, by sighting along the top.

At first glance, one would say the hose level is not a sighting instrument, readings are taken direct. However, when we bear in mind that no matter where the staves are placed, the two water surfaces are at the same level, the hose level has possibilities. A line from one water surface to the other is horizontal and a sight can be taken over these surfaces.

This method of sighting is used to find out approximately where a contour line will finish over the other side of the paddock. The two staves are held about 6ft. apart and one moved around until the water surfaces appear the same height as the top of the far fence. A contour line would finish near this point. A gradient line will finish about one chain above or below this, according to the way it flows. The same method can be used for finding out whether a water supply is above or below the level of a proposed tank or trough.

Finding Fall or Vertical Interval.

To find the fall:—

(a) Between contour banks to get even spacing.

(b) Between water supply and tanks, etc., in solving water reticulation problems.

(c) To determine the safe height of a dam or earth tank wall before construction.

Start with the rear staff on the line or point from which you wish to measure. Move the leading staff in the required direction until the readings are different by 12in., put in a peg and move on. Repeat this and the rear man pulls out the previous peg. If this is done for every foot of vertical height, the number of pegs the rear man holds, is the number of feet vertically traversed.

USES NOT CONNECTED WITH SOIL CONSERVATION

For foundations, wooden or concrete floors, troughs, tanks, guttering, etc., the farmer can find a use for the hose level. An accuracy within $\frac{1}{8}$in. in 50ft. can easily be obtained.

SPEED AND ACCURACY

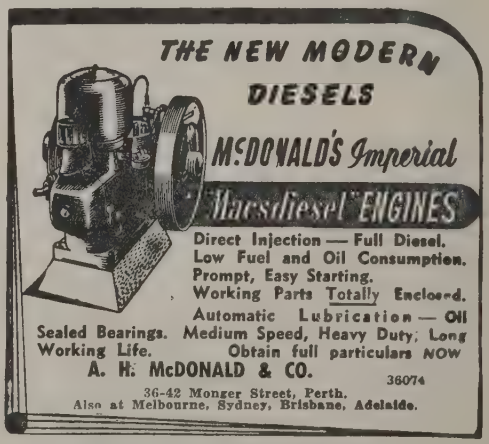
The hose level has been checked for speed and accuracy against the dumpy levels, used by Soil Conservation Officers.

For vertical interval measurement and distant sighting the dumpy level is superior.

In some circumstances, contour surveying with the hose level may be quicker and is often more convenient. It can be used through trees and orchards, in drizzle and in strong wind. The two operators are in contact all the time and the more experienced man can take the lead and make decisions. This latter is not possible with the dumpy level, where the less experienced man takes the staff.

The writer has found, with nine months use of the hose level, that surveying for farm soil conservation works, with the farmer helping, is more convenient with the hose level. The standard dumpy level is better for distance sighting, lengthy traverses for water reticulation problems and checking soil conservation work.

The hose level used under practical conditions is only slightly less accurate than the better class dumpy level, but is well within the limits of accuracy required for soil conservation work. Tests carried out showed that the hose level is the only home-made levelling instrument that has sufficient accuracy for laying out all types of contour and grade lines in soil conservation work.



Write for Leaflet giving further details

A. H. McDONALD & CO.
PTY. LTD.
Showrooms & Works:
566-574 BRIDGE ROAD,
RICHMOND, E.1., Victoria
38-42 MONGER STREET, PERTH
and at MELBOURNE, SYDNEY, BRISBANE & ADELAIDE

POINTS ON SUBMITTING PLANT SPECIMENS FOR DISEASE IDENTIFICATION

By MISS ROSE McALEER, B.Sc., Plant Pathologist

MOST farmers, orchardists and gardeners are only too well aware of the heavy losses caused every year by various plant diseases. It is perhaps not so widely known that the Plant Pathology Branch of the Department of Agriculture offers a free service in the identification of these diseases and gives free advice on prevention and treatment.

Every day, the Department's plant pathologists receive specimens of diseased plants with requests for advice on the cause of the trouble and the types of treatment to be applied.

Sometimes identification is a simple matter. The symptoms are obvious at a glance and there are no complications. In other cases, a laboratory examination is needed to pinpoint the cause of the trouble.

The easily recognisable symptoms vary quite a lot. On leaves we often encounter spotting, yellow mottling, brown scorching around the margins, curling, streaking or mildew-like growths. Stems are often seen with dark streaks or spots; and splits or cankers on limbs of trees are common. Sometimes the whole plant may be stunted, show wilting, die-back of tips or whole branches, or be generally unthrifty. Stunting, wilting, die-back and unthriftiness are often manifestations of trouble in other parts of the plant.

When submitting specimens be careful to send in material that will help to identify the trouble.

If a plant appears quite healthy, apart from some spotting on the leaves, an unusual growth on the stem and leaves, or perhaps some type of streaking or scorching, it is usually sufficient to submit representative samples of the affected parts. Frequently, however, the only symptom may be a wilting of the foliage or a general unthriftiness, the cause of which is not obvious. Wherever possible in such cases submit the whole plant, roots and all. For example, a tomato plant affected with Fusarium wilt, or one with its roots badly affected with eelworm, becomes unthrifty and shows wilting. These diseases cannot be identified from the leaves, for although the leaves show some symptoms the actual cause of the trouble lies in the stem or roots and only an examination of these portions of the plant will give a reliable clue to the cause of the trouble. The remedy for wilt, of course, is vastly different from the remedy for eelworm.

Wherever possible, try to select a range of specimens illustrating the disease from the early to the advanced stages. When an almost dead plant is submitted, the real symptoms are very difficult to see, whereas if we examine plants at earlier stages of the disease identification is simplified. Sick plants, like sick animals or human beings, are liable to contract secondary disease which, in some cases, may obscure or complicate the original ailment.

Another important point is the method of packing specimens for transport. This depends largely on the nature of the specimen and the time it takes on its journey. Send freshly-picked specimens, first washing the earth from the roots as it is not required and often soils and damages the leaves thus hiding the symptoms. Don't pack fruit in air-tight tins—they'll probably go mouldy before arrival—it's better to wrap each separate fruit in newspaper and then to pack them in a cardboard box with a few holes in it. Tomato plants wheat plants and similar specimens probably travel best if placed between sheets of newspaper and kept rigid with cardboard. Post specimens early in the week, as they may deteriorate if they arrive during the weekend.

In conclusion, always send a covering letter giving the names of the plants affected—specimens are often difficult to identify on arrival in Perth. Many diseases are specific to certain plants and a knowledge of the varieties affected often makes disease identification easier.

Details of any manures or fertilisers used, and of any sprays or dusts applied should be given—also any information concerning watering, particularly the salt content of the water used.

THE GRADING OF FRUIT AND VEGETABLES

By E. H. RAWSON, Fruit Inspector

WHEN the housewife goes to buy fruit and vegetables, her choice is influenced in the first place, by the appearance of the produce offered for sale. Soundness, size, colour and general appearance—taken in conjunction with the price—are the main points which influence her buying. She will see different grades of fruit and vegetables at different prices and will make her purchase according to her taste and the state of the household budget.

The grading of produce, according to quality, is an important feature of commercial fruit and vegetable production. It is part of a system designed to protect the grower, the wholesaler, retailer and the consumer alike.

Good grading—which might briefly be described as sorting into separate lines according to size, appearance and quality —can make a tremendous difference to the price which a grower receives for his crop.

Bad grading can nullify much of the work and expense put into the growing of the crop.

If the grower really wishes to produce fruit of the best quality, grading should begin in the orchard during the growing season. When they are large enough, malformed and blemished fruits should be thinned out, thus helping the balance of the fruit to improve in size and quality, and at the same time reducing the work of sorting during the harvesting period. Grading should be continued during the picking season to remove badly sunburnt fruits and others showing defects which have developed since thinning. This saves valuable time and space in the packing shed.

Where it has been installed in the larger packing sheds, modern machinery has facilitated grading to a large extent, but grading of fruit and vegetables is a job that the machine cannot do alone.

In Western Australia, apples, pears, oranges, lemons grapefruit, bananas, potatoes and onions are graded according to regulations that are enforced by trained inspectors. This promotes confidence, and the grades provide a sound basis for trading on both home and export markets.

Apart from the grading by regulation in the case of the fruits and vegetables named, there has grown up over the years a very high standard of voluntary grading in other produce offered for sale as the Metropolitan Markets. This has come about naturally, by competitive buying and keen marketing by certain growers—and visitors to this State invariably comment favourably on the quality of the produce offered for sale and the manner in which it is graded.

The importance of grading to both grower and consumer might be illustrated by a reference to the new season's oranges that made their appearance on the market towards the end of April.

The grading regulations for citrus fruit, stipulate that the fruit must not only comply with certain standards concerning size, colour, amount of blemish and soundness—it must also have an adequate sugar content—or in other words, have achieved a certain stage of ripeness.

At that time of the year, the market is usually bare of oranges and high prices are paid for early navels. Oranges do not ripen after picking and, although treatment with ethylene gas can give immature oranges an attractive colour, it cannot make them sweeter.

Each year, inspectors mark down to "Inferior" grade, many cases of oranges which are satisfactory except in one respect. They are immature and therefore sour, and it is generally felt that the industry suffers through the sale of these sour oranges.

Early in the season, tests for acidity can be applied at the Market Inspector's office, suspected lines are tested and—if they don't measure up to the required standards—they are de-graded.

Good honest grading pays off in better prices for fruit and vegetables, and growers should realise that a buyer bases his price not on the best fruit in the case, but on the worst, thereby safeguarding himself against the quantity of inferior fruits that may be in the case. I suggest that it would be to the interests of growers to put in a few hours at the markets. See what you have to compete against—compare your produce with the other fellow's —and I think you'll agree with me when I say that good grading pays dividends.

BINDING OF JOURNALS

To keep your journals clean, orderly and readily accessible, have each volume of six issues strongly bound in a durable and attractive cover.

29/- for completed binding including cover.
24/- with cover supplied by customer.
Packing and postage is FREE in W.A.

Please enclose name and address and cost of binding with journals, and send to:—

A. PRITCHARD,
General Bookbinders,
130a Murray Street,
PERTH, W.A.

SATISFACTION GUARANTEED

'PESPRUF' DDT Dusts and Sprays

"'PESPRUF' saved me pounds last year—you should use it too!"

PESTS DISAPPEAR . . .

PROFITS INCREASE . . .

When Growers use—

'PESPRUF' DDT

20 EMULSION SPRAY OR 50 DISPERSIBLE POWDER

FOR FRUIT, VINES AND VEGETABLES

Obtainable from your Usual Supplier

W. Aust. Distributors.

Elder, Smith & Co., Limited, 113 St. Georges Terrace, Perth, *and* Westralian Farmers Co-op. Ltd., 569 Wellington St., Perth.

PES.20W.1452

A DEPENDABLE PLANT PROTECTION PRODUCT

IMPERIAL CHEMICAL INDUSTRIES (ICI) OF AUSTRALIA & NEW ZEALAND LTD.

SUNRISE AND SUNSET TIMES FOR SEPT.–OCT., 1955

(Supplied by the Government Astronomer)

Times of sunrise and sunset for every fifth day, are given for a number of towns throughout the State. Times for a town not on the list may be estimated if its position in relation to one or more of the listed towns is known. The times given for sunrise are those of the first appearance of the top edge of the sun over a true horizon; those for sunset give the time of the sun's disappearance below a true horizon. Situation in a valley would make the sun appear to rise later, and on a hill it would appear earlier.

SUNRISE

Month.	Day of Month	Broome.	Port Hedland.	Onslow.	Carnarvon.	Yalgoo.	Geraldton.	Moora.	Kalgoorlie.	Southern Cross.	Merredin.	Perth.	Tammin.	Northam.	Narrogin.	Collie.	Bunbury.	Katanning.	Bridgetown.	Hopetoun.	Esperance.	Cape Leeuwin.	Albany.
Sep.	1	5·59	6·15	6·30	6·37	6·28	6·37	6·33	6·11	6·20	6·24	6·35	6·28	6·31	6·30	6·35	6·37	6·30	6·35	6·20	6·13	6·40	6·29
,, ...	5	5·56	6·12	6·27	6·34	6·24	6·33	6·29	6·7	6·16	6·20	6·30	6·23	6·26	6·25	6·30	6·32	6·24	6·29	6·14	6·7	6·34	6·23
,, ...	10	5·51	6·7	6·22	6·28	6·18	6·28	6·22	6·0	6·9	6·13	6·24	6·17	6·20	6·18	6·23	6·25	6·18	6·23	6·8	6·1	6·28	6·16
,, ...	15	5·48	6·3	6·18	6·23	6·12	6·22	6·16	5·54	6·3	6·7	6·17	6·10	6·13	6·12	6·17	6·19	6·11	6·16	6·1	5·54	6·21	6·9
,, ...	20	5·43	5·58	6·12	6·17	6·6	6·15	6·9	5·47	5·56	6·0	6·10	6·3	6·6	6·4	6·9	6·11	6·3	6·8	5·53	5·46	6·13	6·1
,, ...	25	5·38	5·53	6·7	6·12	6·0	6·9	6·3	5·41	5·50	5·54	6·4	5·57	6·0	5·57	6·2	6·4	5·56	6·1	5·46	5·39	6·6	5·54
,, ...	30	5·35	5·50	6·4	6·8	5·55	6·4	5·58	5·36	5·45	5·49	5·59	5·52	5·55	5·52	5·57	5·59	5·51	5·56	5·41	5·34	6·1	5·49
Oct.	1	5·34	5·49	6·3	6·7	5·54	6·1	5·57	5·35	5·44	5·48	5·57	5·50	5·53	5·51	5·56	5·58	5·49	5·54	5·39	5·32	5·59	5·47
,, ...	5	5·32	5·46	5·59	6·3	5·50	5·58	5·51	5·29	5·38	5·42	5·52	5·45	5·48	5·45	5·50	5·52	5·44	5·49	5·34	5·27	5·54	5·41
,, ...	10	5·27	5·41	5·54	5·58	5·44	5·53	5·45	5·23	5·32	5·36	5·46	5·39	5·42	5·39	5·44	5·46	5·38	5·43	5·28	5·21	5·48	5·35
,, ...	15	5·22	5·36	5·49	5·52	5·37	5·46	5·38	5·16	5·25	5·29	5·38	5·31	5·34	5·32	5·37	5·39	5·30	5·35	5·20	5·13	5·40	5·27
,, ...	20	5·19	5·32	5·44	5·47	5·32	5·40	5·32	5·10	5·19	5·23	5·32	5·25	5·28	5·25	5·30	5·32	5·23	5·28	5·13	5·6	5·33	5·20
,, ...	25	5·17	5·30	5·42	5·44	5·28	5·36	5·28	5·6	5·15	5·19	5·28	5·21	5·24	5·20	5·25	5·27	5·18	5·23	5·8	5·1	5·28	5·15
,, ...	31	5·12	5·25	5·37	5·38	5·22	5·30	5·22	5·0	5·9	5·13	5·21	5·14	5·17	5·14	5·19	5·21	5·11	5·16	5·1	4·54	5·21	5·8

SUNSET

Month.	Day of Month	Broome.	Port Hedland.	Onslow.	Carnarvon.	Yalgoo.	Geraldton.	Moora.	Kalgoorlie.	Southern Cross.	Merredin.	Perth.	Tammin.	Northam.	Narrogin.	Collie.	Bunbury.	Katanning.	Bridgetown.	Hopetoun.	Esperance.	Cape Leeuwin.	Albany.
Sep.	1	5·43	5·57	6·10	6·13	5·58	6·7	5·59	5·37	5·46	5·50	5·59	5·52	5·55	5·53	5·58	6·0	5·51	5·56	5·41	5·34	6·1	5·48
,, ...	5	5·45	5·59	6·12	6·15	6·1	6·10	6·2	5·40	5·49	5·53	6·2	5·55	5·58	5·56	6·1	6·3	5·54	5·59	5·44	5·37	6·4	5·51
,, ...	10	5·45	5·59	6·12	6·16	6·3	6·11	6·5	5·43	5·52	5·56	6·5	5·58	6·1	5·59	6·4	6·6	5·57	6·2	5·47	5·40	6·7	5·55
,, ...	15	5·46	6·1	6·14	6·19	6·6	6·14	6·8	5·46	5·55	5·59	6·9	6·2	6·5	6·2	6·7	6·9	6·1	6·6	5·51	5·44	6·11	5·59
,, ...	20	5·46	6·1	6·15	6·20	6·8	6·17	6·11	5·49	5·58	6·2	6·12	6·5	6·8	6·5	6·10	6·12	6·4	6·9	5·54	5·47	6·14	6·2
,, ...	25	5·48	6·3	6·17	6·22	6·11	6·20	6·14	5·52	6·1	6·5	6·15	6·8	6·11	6·9	6·14	6·16	6·8	6·13	5·58	5·51	6·18	6·6
,, ...	30	5·49	6·4	6·18	6·24	6·13	6·22	6·16	5·54	6·3	6·7	6·17	6·10	6·13	6·12	6·17	6·19	6·11	6·16	6·1	5·54	6·21	6·9
Oct.	1	5·49	6·4	6·19	6·24	6·13	6·23	6·17	5·55	6·4	6·8	6·18	6·11	6·14	6·13	6·18	6·20	6·12	6·17	6·2	5·55	6·22	6·10
,, ...	5	5·49	6·5	6·20	6·26	6·15	6·25	6·19	5·57	6·6	6·10	6·21	6·14	6·17	6·15	6·20	6·22	6·15	6·20	6·5	5·58	6·25	6·13
,, ...	10	5·50	6·6	6·21	6·28	6·18	6·27	6·23	6·1	6·10	6·14	6·24	6·17	6·20	6·19	6·24	6·26	6·18	6·23	6·8	6·1	6·28	6·17
,, ...	15	5·52	6·8	6·24	6·31	6·21	6·31	6·27	6·5	6·14	6·18	6·29	6·22	6·25	6·23	6·28	6·30	6·23	6·28	6·13	6·6	6·33	6·22
,, ...	20	5·52	6·9	6·25	6·33	6·24	6·34	6·30	6·8	6·17	6·21	6·32	6·25	6·28	6·27	6·32	6·34	6·27	6·32	6·17	6·10	6·37	6·26
,, ...	25	5·55	6·12	6·28	6·36	6·28	6·38	6·34	6·12	6·21	6·25	6·36	6·29	6·32	6·32	6·37	6·39	6·32	6·37	6·22	6·15	6·42	6·31
,, ...	31	5·57	6·14	6·31	6·39	6·31	6·42	6·38	6·16	6·25	6·29	6·41	6·34	6·37	6·36	6·41	6·43	6·37	6·42	6·27	6·20	6·47	6·36